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Hugh Cecil Earl of Lonsdale.

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PART SECOND

OF A

SERIES

OF

ELEMENTARY LECTURES

ON THE

VETERINARY ART:

WHEREIN THE

ANATOMY, PHYSIOLOGY, AND PATHOLOGY

OF THE

HORSE,

ARE

ESSAYED ON THE GENERAL PRINCIPLES

OF

Medical Science.

BY

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"Qui secat, sit anatomes peritus, quia sub hoc medico et artifice, omnia tutissime et felicissime peraguntur."—*Fabricius ab Aquapendente.*

"Morborum quoque te causas et signa docebo."—*Virgil.*

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VETERINARY LECTURES.

LECTURE XXIV.

On the Teeth.

THESE instruments for the abscission and manducation of food, are remarkable in the horse, for number, size, and durability. Unlike other parts, at certain periods of life, the teeth first produced are cast off and replaced by others; a phenomenon that has given rise to the general division of them into *temporary* and *permanent* sets; of which I shall first examine the

Permanent Teeth.

AT the age of five years a horse is said to have "a full mouth;" *i. e.* he is furnished with a complete set of permanent teeth: in number, forty.

The teeth of the horse are so situated, in either jaw, that they are naturally distributed into three classes; two of which have received names from their respective offices in mastication, and the other an appellation in allusion to its form:—the first comprises twelve *dentes incisores*, or cutting teeth, six in each jaw; the second,

twenty-four *dentes molares*, or grinding teeth, twelve in each jaw, the third, four *dentes cuspidati vel canini*, or pointed or dog's teeth, two in each jaw: the teeth of the anterior and posterior jaws correspond in number and situation, and have a close resemblance to one another.

In every tooth, of whatever class, we remark two parts, one exterior to the gum, the other buried within its alveolus or socket: to the former, for the convenience of description, I shall give the name of *body*, and that of *face* to the wearing surface of it, the latter, I shall call the *root*, and the conical or pointed extremity of it, the *fang*.

Dentes Incisores.

The twelve* dentes incisores, or cutting teeth, or nippers and gatherers, are regularly ranged, in parabolic curves, in the lowermost parts of the jaws, and are at once brought into view by the separation or eversion of the lips. It will be remembered here, that, in describing the ossa maxillaria anteriora and the maxillæ pos-

* In the Museum at the Veterinary College, there are two anterior jaws, containing, each of them *eight* incisors of ordinary size; in one, they are very irregularly placed, in the other, less so. I apprehend that the corresponding jaw (for they were not preserved) had not more than the usual number. I have met with another specimen of the same, or a similar, which the teeth, of their natural size, were ranged in due order. Mr Cline's has a posterior jaw in his possession in which there are but four incisors; not of extraordinary irregularity, the alveolar prominence altogether is so narrow that there is not room for more: the anterior jaw holds the complement of teeth, and is correspondently of a proportionate breadth. I have also by me a mutilated specimen of the same sort.

terior*, I pointed out the alveolar cavities proper to these teeth—remarking that they were composed of two laminæ, intersected by transverse, thin, osseous plates: these cavities are three-sided, about two inches deep, grow pointed at bottom, and incline inwards; and are nicely fitted and filled by the roots of the incisores.

In its general figure, an incisor approaches to that of a bent cone, of which the face is the base and the root the truncated apex; but if its form be analysed, its base will be found to be oval, its body circular, and its root triangular; and such is the variation of figure that the face naturally undergoes through life, that it may veritably be said to pass through several transformations. Though the triangle of its root is nearly equilateral, and the sides of it are all furrowed, they are so unlike, that, by attention to them and the general inclination of the tooth, it is not difficult to assign to every incisor its proper place in the jaw.

In length an incisor of the posterior jaw measures about $2\frac{1}{2}$ inches; in breadth, the long axis of its face, $\frac{5}{8}$ of an inch: the front teeth are a little longer than the middle, the middle than the lateral; of the first, about eight lines appear above the gum; of the second, seven lines; of the third, six lines.

The body is whiter than the part below it, and is superficially marked in front by one or two longitudinal furrows, according to the breadth of the tooth.

The face presents an oval-shaped pit in the centre, and two elliptical rims or borders around it, whose breadth decreases with its depth, and whose depth, for a

* Lect. xxiii. Part I.

certain number of years, bears a given ratio to the age of the horse. This pit is rendered conspicuous by a lining, consisting of a thin scaly incrustation of black earthy matter, and commonly contains a little dirt. It has been likened to the eye of a bean, and thus has obtained the appellations of *mark*, *bean*, &c. in speaking of age. The rims around it are white and prominent, and constitute the cutting or wearing edges of the tooth; the outer one, that borders the face, particularly the inferior segment of it, projects a little beyond the inner, and is indented, about its middle, by the termination of the furrows along its body.

Internally the tooth is hollow, but its body contains an *infundibulum*, or funnel like tract, whose mouth is the pit above noticed; independant of this the cavity altogether corresponds in shape and dimensions to the tooth itself, and is entered by an opening at the extremity of the fang.

The anterior incisors are larger and more developed than the posterior, and the semi circular portion of jaw that contains them in like ratio exceeds in dimensions its opponent: on this account their outward edges commonly overshoot a little those of their fellows, indeed so much so in some horses, that their inward are actually opposed to the pits, instead of the edges of the latter, but in others they meet with precision, and now and then the reverse occurs. Their infundibula also are larger and much deeper than those in the back teeth.

In comparing the operation of these teeth to that of a pair of nippers or scissars, the advantages of this conformation and collocation of them cannot fail impressively to strike us, and in duly estimating the

force the jaws are capable of exerting, and bearing in mind the sliding or scissar-like action of them, the apparatus altogether must appear as effectual as it is simple and admirable in its construction. By means of his incisores, a horse nips the finest, nay the shortest blades of grass; by means of the same teeth, his hard oaken crib is wantonly crumbled into dust: even iron itself can scarce resist their gripe. In grazing, or in browsing, these teeth seize the substance, but the division of it, which the animal effects by a twitch of the head, is rather an act of rupture than one of dental section—*vellet dentibus herbas*—and this vellication, in taking food, is equally remarkable in the stable, when a horse is eating his rack-meat, even though it is there ready cut for him. In fact, these teeth appear rather to demand the name of dentes *vellentes* than dentes *incisores;* and they who named them *nippers and gatherers,* have left us reason to conclude, that they, at least, had paid attention to their economy; for, in feeding upon pulse or grain, the incisores do little more than (aided by the lips) *gather up* the seed, in order that it may be passed on by the tongue to the molares or grinders of it.

Dentes Molares.

The molares or grinding teeth, twenty-four in number, are implanted in rows into the *sides* of the jaws. Six upon each side are encased in the alveolar cavities of the os maxillare superius, at the space of about four inches from the incisores; the twelve others, their opponents, are fixed within those of the maxilla inferior, somewhat nearer to the lower teeth*.

* This appears to be for the purpose of maintaining that due

A dens molaris is equal in magnitude to four or five incisores; it varies in length from 2½ to 3 inches; in breadth, in the anterior jaw, from 1 to 1½; in the posterior, they are little more than half as broad: they are therefore not likely to be mistaken for one another.

The figure of an anterior molaris is that of an oblong quadrangle, slightly incurvated in order to accommodate it to the contour of the jaw: the posterior, though similar at first sight, is straight, and flattened from being so much less in breadth, so that the quadrangle, still an oblong one, has its sides more unequal. The first and last molares of either jaw, are known at once by being triangular: the extended angles of the four inferior are directed downwards; those of the last or superior, upwards. Indeed these four teeth, instead of being inclined inwards in their sockets, are laterally curved; so that the upper ones of the anterior jaw press, with their roots, against the floor of the maxillary sinuses, and those of the posterior jaw run upwards into its branches. The channels along its sides strike us with a notion that a molaris was originally composed of four incisores, now become one and the same tooth by inter-union of substance; in the composition of the lateral teeth, indeed, five nippers seem to have been embodied.

The conspicuous objects upon the face of a molar tooth are *two transverse ridges*, with transverse furrows between them, and *two pits*: those that are of a triangular figure have an additional eminence, jutting from the point of the extended angle. The pits, like those

relative position which must otherwise have been disturbed by the projection of the anterior jaw.

of the incisores, are incrusted with a dark or black earthy lamella, and assume the appearance and take the name of *marks*; they are not of long continuance however, nor do they (that I am aware) disappear at any regular or stated times; and consequently afford us no useful information concerning age.

The tooth is hollow within, and imperfectly divided into chambers by two infundibula, which extend through it and terminate within the cavities of the roots.

From the alveolar portion of it, which is truncated, after a time, proceed the fangs; which are short, conical tubes, flattened at their sides, and open at their ends. They are three in number:—two outer, and one inner; and the broad side of the inner one is opposed to the sharp angles of the two outer; in which manner the quadrangular figure of the tooth is still preserved*. But a posterior molaris has but two fangs; and they are placed on a line with each other.

The molar teeth, arranged in their sockets, present upon each side of either jaw, a serrated wearing surface of more than half a foot in extent: the faces of the anterior incline from without inwards, those of the posterior slope in the opposite direction; so that, when in apposition, they meet upon a level with one another. The anterior jaw is about an inch and a half wider than the posterior; and, when the mouth is shut, the anterior molares, all but the last, laterally overhang about half an inch their opponents; but inwardly, the posterior teeth project a little beyond them. When the

* The first and last anterior molares often have but two fangs: when three are present, they are disposed triangularly.

jaws are approximated, therefore, the slanting ridges of one tooth are obliquely received into the sloping furrows of its fellow, to which they are adapted; by this disposition of them not only is the surface of mastication amplified, but the powers of contusion and trituration greatly augmented in efficiency. But in order fully to comprehend and appreciate the construction and operation of this remarkable apparatus, it will be necessary to understand the action of the posterior jaw.

By the depression of this bone, downwards and backwards, the mouth is opened; by a contrary motion of it, it is shut: of the muscles attached to it for these purposes, those are by far the most powerful that elevate the jaw. In addition to these movements, the jaw can be drawn to one side, in a limited degree, by the unopposed contraction of the muscles of the other side; and by alternating the action of these muscles with that of their antagonists, it may be slid first on one side and then on the other: this is what is meant by the lateral or grinding motion of the jaws.

Here, then, are four jagged surfaces of impenetrable hardness, opposed to four others equally hard and uneven, having the power of shutting into one another not only with great force, but with great exactitude, and of sliding laterally upon and rubbing against one another when in apposition. Seeing this, are we to feel surprised that the hardest pulse are contused, that the smallest seeds are crushed, and that nothing, in fact, under the denomination of provender, be it ever so hard or ever so small, can escape the operation of this admirable piece of animal mechanism! In no animal is this rotatory or grinding motion of the jaw better demonstrated than in the ruminant, in which, this bone,

in its sphere of rotation, appears to describe so many irregular circles; and indeed, this is the kind, though not the degree, of action that it has in the horse, during which the molares, (according to the import of their name,) like so many millstones, bruise, break down, comminute, and triturate whatever substance may be interposed; in short, so demolish it that the juices of the stomach may readily soak through and dissolve it.

Dentes Cuspidati.

The dentes cuspidati vel canini, or tusks, are four in number:—two in each jaw *.

They arise out of conical sockets, in isolated stations in the jaws, between the last molares and lateral incisores, about an inch from the latter in the posterior, about an inch and a half from them in the anterior jaw; but this space increases with age †.

In figure, the tusk, when first cut, is a cone, slightly incurvated, whose base is sunk in the jaw; afterwards, however, it becomes conical at either end, and the bases of these cones are united at the gum. When fully evolved, the tusk projects nearly or quite an inch from its socket, and terminates in a curved pointed extremity.

During its growth—generally until the sixth year, about which time it is completely developed—the in-

* I have a posterior jaw that contains three tusks: two, on the near side, spring from separate sockets.

† From the fact of the distance between these teeth growing greater with age, I was led to think that an useful criterion might be made of it; but I found so much variety that I was compelled to relinquish it for this simple conclusion:—that the inter-space extends, but not regularly, with the accession of years.

ward part of it is slightly concave and fluted: it has two longitudinal furrows along it that meet at its point like the two legs of a triangle, leaving a conical eminence between them, but as age proceeds, the intervening portion of tooth swells out from continued accretion, and the part gradually assumes a convexity; indeed so much does the tusk alter its form by the eleventh or twelfth year that the originally pointed cone is worn down to a regular cylinder.

So long as the tusk lies hidden in its socket, it has no fang: it consists simply of a thin thimble-like shell of hard substance, but as the body emerges the root also elongates, and a fang forms, which is only perfected when the tooth itself has attained its greatest evolution in the mouth. At this period the tusk is hollow throughout, and is perforated at its root by a small foramen, but as years advance the cavity gradually fills up, and in old horses we can perceive no remains of it.

It is said that mares have no tusks. So far as my examinations have gone I have not found any jaws without the rudiments or face-smiths of them, though they are not commonly seen but during or past the middle ages of life. whether all females that live to old age cut them prior to death, I am not certain—I am disposed to think that they do*.

These teeth are so set in the jaws, that their points cross and not meet one another. The posterior are longer and more luxuriant than the anterior. It appears to me, that tusks were given to the horse, in

* "There is an *hermaphrodite* horse, twenty six years of age, kept at this school (Berlin,) it is similar to that at Vienne, and has tushes like a stallion." Mr Sewell's *Report.*

whom they are not so formidable as in other animals, as weapons of defence; he has an advantage however over most of them in being able to combat with an adversary behind as well as before: his hoofs enable him to repulse a foe in pursuit, his tusks seem designed for attack.

Temporary Teeth.

From the age of ten months to that of two years and a half, the horse has a certain number of teeth, denominated his *sucking*, *milk*, *shedding*, or *temporary set*. They are twenty-four in number:—consisting of twelve incisores, six in each jaw; and twelve molares, three upon each side, above and below*.

The temporary incisores are readily known, either *in situ* or out of their sockets, from the permanent, in being smaller and whiter, in having no furrows upon their bodies, in having *necks* or contractions where the root joins the body, and in having slender pointed fangs. The molares in the young animal are smaller and whiter, and have sharper eminences upon their faces.

Those denticular excrescences called *wolves' teeth*, notwithstanding they are so generally met with, I regard as *lusus naturæ*—as constituting no part of a regular or full set of teeth. They spring out beside and anterior to the first molares, in both jaws, with which they are commonly cast off, never to be replaced.

The temporary teeth are shed in succession to make room for the permanent: as the latter grow in sockets

* The eight upper grinders and the tusks do not make their appearance within this period, and are not shed; no more are the fourth molares, but they exist with the temporary set.

contiguous to them, these, by absorption of their fangs, continue to give place, and at length drop out. They are not pushed out, as the vulgar will have it; but that pressure has an influence upon the absorbing process is demonstrated by the aspect of their ulcerated bases—more particularly of those of the molares—which bear the exact impressions of the faces of the forthcoming teeth.

Structure of the Teeth.

Two hard substances, distinct from each other in aspect and nature, enter into the formation of the tooth. one, *enamel*, is peculiar to it, the other, in consequence of putting on the appearance of, is generally described as, *bone*.

The Enamel. In examining an incisor, we find that the body of it is whiter, smoother, and harder than any other part, and that it has a polish upon its surface as if, being exterior to the gum, it were designed for ornament: these appearances it owes to a coating of enamel. So impenetrably hard is this substance that files and saws make but little impression upon it, and it is fractured but with considerable force: its fragments exhibit a fibrous composition, and its fibres proceed, like radii, from the body of the tooth towards the wearing surface of it. To many chemical agents however it opposes but a faint resistance: by the mineral acids, and by some of the vegetable indeed, it is more or less quickly corroded: the nitric and muriatic acids dissolve it, sulphuric exerts a slower action upon it, and concentrated distilled vinegar gradually roughens and erodes it. The essential difference between enamel and the bony substance is, that the for-

mel has no animal or organizable matter in its composition: it is believed to be a secretion, originally in a fluid or semi-fluid state, which by chrystalization assumes its characteristic solidity and hardness. If a tooth be exposed to the action of fire, the bony part turns black from destruction of its animal ingredient, but the enamel preserves, almost unsullied, its former whiteness: by this simple experiment, many very neat preparations may be made; and it is of the greatest service in this stage of our inquiry, from the distinct and beautiful manner in which it displays the distribution of this substance within the body of the tooth.

Of an incisor, the enamel completely coats the body, and is consequently more abundant outwardly than inwardly; from which it passes upon the face, where it is reflected inwards, and deeply sunk in the shape of a funnel, having an elliptical mouth, into the body of the tooth, and thus forms the infundibulum or pit; but as soon as the face is worn a little, (which speedily follows the evolution of the tooth,) the reflected portion, being disunited, has the appearance of a separate layer, and then the elliptical edge of it forms the *inner rim:* the interspace, which is greater below than above, is filled up with bony matter.

About a molaris, the disposition of the enamel, while it evinces much regularity and beauty in appearance, may carry with it a notion of complication in description, which it seems difficult to divest it of. The body, like that of an incisor, is externally defended by enamel; but unless the tooth be examined when fresh cut, it is commonly found to be encased with a thin lamen of a substance of an earthy nature, that gives that unwholesome—yellow or black—aspect to it which it

evidently has when contrasted with the other teeth: immediately underneath this case, then, which I regard as adventitious and extraneous, and which often in places chips off and exposes it, is the enamel. But, in place of there being one inner lamen or reflection of it, there are two: the molars having two infundibula from which two inner rims are formed by wear, whose circumvolutions upon the face together correspond to those of the outer rim: in this manner the enamel penetrates the very heart of the tooth, and defends it to the last against the effects of mordication and attrition. It follows, therefore, that in the new tooth we find the eminences of the wearing surface completely coated with enamel; but its depressions without any.

Of the tusk, the body is completely encased in enamel: it is not so thick upon the inward or fluted part as elsewhere, and grows thin and imperceptibly vanishes upon the base.

Bone of the Tooth. It is mostly an unthankful undertaking to meddle with or alter names, though admitted to be inappropriate, that established usage has once confirmed; and this appears to be the reason why the one above still keeps its ground with most teachers and writers of the present day. What is called the *bone* of the tooth is unlike in its origin the bones truly so named, unlike in its mode of subsistence and regeneration, in its properties, in fact in all but its chemical composition, and according to some, in that *. Indeed, though it is resolvable into a gelatinous matter

* Some continental chemists say that in addition to the earthy and saline matters found in bones, this substance contains fluoric acid, in combination with lime.

and an earthy, which is chiefly phosphate of lime, there is an additional quantity of the latter in its composition, and that is more closely compacted; to which we may apparently ascribe the characteristic density and hardness of it. Again, although a substance something like cartilage is left, which has the form of the original tooth, when it has been deprived of its earthy components by acids, it was never, like bone in its primitive state, cartilage; nor does it contain any medulla or cancellated structure. It is covered exteriorly by periosteum, through the medium of which it has a firm adherence to the sockets and gum, but, though like bone it receives a tincture when an animal has been fed with madder, it is not supplied with blood in the same manner; for its vessels, which cannot be traced further than the surface, are derived from the interior—from the pulp. Internally it is hollow; and the shape and size of this—*the cavity of the tooth*, bear an analogy to those of the tooth itself.

Within this cavity, contained in a membrane of a periosteal nature, denominated the *membrane of the tooth*, is the *pulp*, or what is regarded by the vulgar as the *nerve* of the tooth: it is a gelatinous substance of correspondent bulk and form to the tooth that contains it. In the molares there are several pulps from which processes are sent down into the fangs, and every one of them is inclosed in a membrane of its own; but an incisor, or a tusk, has but one. The pulp, being that part from which the bony substance derives its vitality, is amply furnished with blood-vessels and nerves, and these make their entrance at the foramen in the fang; hence it is that in very old horses, in whom these cavities are filled and obliterated, and the pulps

have shrunk or been absorbed we occasionally find teeth carious and disposed to fall out. Absorbents without a doubt exist in them, but our means are inadequate to such minute investigations.

Some foreign veterinary anatomists describe a third substance, which they call the *corticale*, *cement*, or *substantia cornea*. Girard thus alludes to it: "The cortical substance which is met with in all herbivorous animals, and which the teeth of the hog show vestiges of, forms a sort of bark; it incrusts upon and envelopes the body of every tooth, and is adapted to a considerable depth into its pit*." If by this be meant the brittle incrustation of a grey, yellow, sometimes black hue, only found upon teeth that have left their sockets, I regard it as extraneous and adventitious: it is often met with upon the molares, seldom upon the incisores or tusks, unless it be late in life; how far it approaches in its composition to tartar I am not just now prepared to state. In all teeth, the infundibulum being a convenient place of lodgment, contains it.

Formation of the Teeth.

About the third or fourth month of fœtal being, the rudiments of the future teeth are discoverable in the alveolar channels of the jaws. They are so many pulpy masses, of the consistence and nature of jelly, in size and form, with the exception of the fangs, like the teeth of which they may be regarded as the *nidi*: they have membranous capsules, and are penetrated by nerves and blood-vessels. Soon after the appearance of this substance, specks like osseous matter may be detected in that part of it which corresponds to the cutting or

* *Anatomie Vétérinaire.* p. 158. tom. I. edit. II.

wearing edge of the tooth; these earthy particles gradually spread, coalesce, and form, by their union, a thin, brittle, bone-like case, denominated the *shell of the tooth*, in which the pulpy matter is inclosed. As the process of conversion goes on, and the shell grows thick and strong, the pulp within, compressed on every side, proportionably diminishes from absorption; and as this process is continued through life, until the cavity of the tooth is blocked up and obliterated, from consolidation of it, the pulp still necessarily shrinks, and ultimately disappears. The shell of the body and root of the tooth is completed before the fang is begun.

In the pulp of an incisor, two or three minute opaque spots first appear in the part to be converted into the outward cutting edge, which, by accretion, compose a thin flexible lamen of bone-like matter, similar in shape to the paring of a human nail; and this is reflected upon itself to form one side of the infundibulum: in like manner, but later, the inward rims are produced, which, by their union with the former, constitute the masticatory surface.

In the pulps of a molaris the points of *ossification* correspond in number to the eminences upon its face, they being the parts that first undergo the change: in the course of conversion they consist of so many bony caps, the outer laminæ of which afterwards constitute the outer wall; the inner unite and compose the infundibula, and from them aliform processes shoot and form the chambers.

The enamel is secreted from the internal surface of the membrane originally covering the pulp. It is ejected in a fluid state upon the shell of the tooth, and first of all

to grow up, and hold the shrunk and pointed roots of the teeth with less and less stability and firmness

Diseases of the Teeth.

This is a subject upon which I have but little to offer. The horse appears to be but very rarely afflicted with those distressing pains, called tooth-ache, by which the lives of many human beings are embittered, and a most fortunate circumstance it is for him; for, if he were, I know of no signs by which he could with certainty direct our attention to the seat of pain, nor of any means we have of eradicating it by extraction. Still I have several preparations now before me, the inspection of which leaves little doubt in my mind, that the animals from whom they were taken were the subjects of tooth-ache, and, if I may venture an opinion from *post mortem* appearances, of a most acute and irremediable description*.

The most interesting case of this kind that has come to my knowledge, is the subjoined, with the particulars of which I have kindly been favoured by Mr. Cherry, V. S. Clapham.

A horse, the property of government, became a patient of Mr. Cherry's for a copious efflux of fœtid discolored pus from the near nostril, unaccompanied with any sub-

* One is a permanent molaris, whose exterior presents masses of adventitious bone, and whose interior is black, ragged, and in part destroyed by caries: its fangs have mouldered away.

Two others are lower jaws, having porous brittle exostoses upon their sides, that form spacious cavities, and communicate with the third and fourth molares through a hole in one of them pus, it would appear, was discharged during life. I should imagine that these cases originated in external injury.

maxillary tumor or apparent ulceration of the pituatury membrane. For two or three months the case was treated as glanders; but no steps having been gained towards amelioration, a consultation was held, and the horse eventually shot.—On examination of the head, the third molaris was discovered in part eroded by caries: about one-third of its fang was deficient, and the remainder rotten. The tooth was loose in consequence of the formation of an abscess within its alveolus, which had established a free vent into the contiguous chamber of the nose. The antrum was partly blocked by internal osseous deposition.

Now, had the molar teeth been examined in this case, prior to death, it would unquestionably have led, from the circumstance of one being loose, to a shrewd suspicion of the nature of it, and might have been the cause of saving a life valuable to the service. It behoves the practitioner, therefore, to be on his guard in pronouncing the sentence of death in such affections as these, which are all huddled together at the present day and styled "*chronic* glanders:" an indefinite and ill-understood malady, and one under which the above case must have for ever remained buried in oblivion, had not the most laudable of motives prompted Mr. CHERRY to inspect the parts *post mortem*.

LECTURE XXV.

On Age.

THE periodical regularity observed in shedding the teeth of the horse, has from very early times attracted the notice of his keeper as a criterion of age; and so unerring a test is it that I do not hesitate to say, that it is evidence on which we ought to rely in preference to any other when the animal has not been bred immediately under our own eye. Art indeed, the ever ready instrument of deception, has exercised its ingenuity to accelerate the process, and thus sacrifice the immature frame to destructive usage; but so uniform is Nature in these operations, that no horseman who has paid attention to the subject can be imposed on, in this manner, in any but horses that have been foaled out of due season. It therefore reflects no little discredit upon a professional man if he be uninformed in this department of his duty, for he is thereby not only incompetent to form a correct diagnosis or prognosis in many diseases, but is absolutely unqualified to estimate the physical powers of the animal, and consequently to duly appreciate or treat him in a state of health.

On the completion of the fifth year the mouth is

furnished with a full set of teeth; prior to which we assign age according to the different stages of the shedding process: but subsequent to the fifth year, which may be regarded as an epoch in age, we form our opinion by the appearances that the teeth assume in the course of a series of changes, which they, with more or less regularity, from year to year undergo. In accordance with these facts, I shall consider age under two heads:—*the shedding of the temporary teeth; and the changes to which the permanent are naturally subject for the remainder of life.*

On the Shedding of the Temporary and the Cutting of the Permanent Teeth.

The permanent teeth, it has been shewn, arise in sockets of their own, while the temporary, in order to make room for them, first lose their fangs, and ultimately a part of their bodies: thus, while the former are springing up in all the vigour of growth, the latter have their vitality sapped by the contraction and disappearance of the pulp, and lose their hold and fall out from absorption of the root. The appearance of the shed tooth, although, I repeat, it is not *pushed* out, warrants our belief that the process of absorption is much promoted by pressure; for the internal part of it is the exact counterpart of the face of the new tooth, as if the one had been long and forcibly impressed by the other.

In ascertaining age, the molares, for two reasons, are never looked at:—in the first place, they are with difficulty examined, or even numbered; and in the second, they afford no information but what is more readily and more correctly obtained from the aspect of the incisores.

Indeed it is but seldom that we examine at the anterior teeth, and when we do, it is by way of corroborative evidence, so that, in fact, our judgment mainly rests, up to the age of five, upon the number and class of the posterior incisores, and after that period, upon the changes they have undergone.

By common consent, in this country, all horses' ages are reckoned from the *first of May*, without any reference to the day or even the month in which they were foaled, so that it be within that year, but I believe that as many mares bring forth in June as in May, and that of those that are thorough-bred the majority foal in February, and some as early as January let this be as it may, however, it is of considerable moment to the sporting world that the ages of all horses, of whatever description, should be dated from the same period, and May perhaps, under all considerations, is happily chosen *. In being called on to affix this precise date however, we are now and then involved in some uncertainty, when we meet with horses that have been foaled either very early or very late in the year these anomalies have given rise to the expressions "a forward month," and "a backward month," or, what are synonimous, "an early foal," and "a late foal;" and indeed in some

* On the turf, it has always been a rule, that the age of a racer shall be reckoned from the May of the year in which he was dropped, without any inquiry whatever into the season, month, or day of foaling, so that the produce in January are actually four months older than they appear, from the ages affixed to them, in the Calendar and these are called *early* foals, whereas those foaled in March are denominated *late*. But the breeders take care not to be too nice in their reckonings, lest in any mares produce in December, and the ages of their offspring be post-dated in place of antidated

cases so remote is the real day of production from the presumed or nominal one, that it is extremely perplexing, or even impossible, to decide whether the animal may have been a late foal of one year, or an early one of that ensuing.

A foal at birth is in the act of cutting twelve molares—three upon each side of each jaw: the middle teeth are generally more developed than the lowermost, these than the uppermost; indeed the faces of the last-mentioned four are often still clothed by the gums. Though at this time there is no incisor apparent, they all lie buried, ready-formed excepting their fangs, within their respective alveoli, at depths correspondent to the order in which they are to make their exit. The teeth of the anterior maxilla are commonly cut some short time before their fellows of the posterior: a remark that applies to the molares as well as the incisores *.

About the expiration of the first, or in the course of the second week—seldom so late as the third—the front incisores make their appearance; and during the fourth or fifth week, they are succeeded by the middle teeth †.

Generally in the course of the sixth month, now and then not before the tenth, the lateral teeth are put forth; and then the animal has his complement of incisores, and is said to have his "colts mouth." It is about this age that the foal, but sparingly supplied with milk from its dam, betakes itself to gather its own subsistence—

* Those horses in which we meet with the contrary have had, most of them, their posterior temporary incisores knocked out; and thereby the appearance of the permanent rendered precocious

† About this time small foramina, containing the rudiments of the tusks, are discoverable in the dried bone, immediately above the prominences of the lateral incisores.

now that Nature has furnished its mouth with a complete set of gatherers and nippers for the purpose.

From this period until the animal has attained his first year, no additional teeth shoot from the jaw: then, a few weeks earlier or later, his first horse or permanent teeth, the fourth molares, show themselves.

In the interval of the first and second years, the fifth molares appear; and the fourth gain their proper level in the jaw.

Between the second and third years, the front permanent incisores displace the temporary; and at the same time, the first temporary molares are shed, and replaced by the first permanent: the outward borders or cutting edges of these and the other incisores, cut the gum about six weeks, or two months, before the inward appear.

Between the third and fourth years, the middle temporary incisores are cast off, and succeeded by the permanent; and the second temporary molares give place to the permanent.

In the interval of the fourth and fifth years, the lateral permanent incisores spring from their sockets, the sixth and last permanent molares make their exit, the third and last temporary molares * are displaced by the third permanent, and the tusks peep from the gums: so that by the fifth year, as was heretofore stated, a horse is furnished with a complete set of permanent teeth.

The respective half-years are commonly set down as the dates when these changes take place, but there is so much variety in this particular that I have chosen

* Not unfrequently this tooth is cut about the same time that the second temporary grinder is shed, or a little while after it.

rather to ascribe them to the intervals between the month of May of one year and that of the year ensuing. It may be asked here, if there be so great variety, how can Nature be said to be periodically regular in these operations? So far as regards the year this is so true that I have never seen, nor even suspected, a deviation from it; and if all horses were foaled in May there would be little or no ambiguity about age: but this is not the case with children; though most of them begin to shed their teeth about seven years of age, anomalies are by no means uncommon; and instances are on record in which some of the temporary set have remained in the head to the adult or even senile period of life. As it is—with the anomalous mouths that we occasionally meet, owing to the casualties of breeding, attendant and chiefly consequent upon our interference with the habits of the horse in a state of nature—we but rarely, prior to the age of five, hesitate to pronounce the *year* of the animal's production; and this being ascertained, his age presumptive—the *postulatum*, is thence deduced: indeed, as we always reckon from the first of May, the calculation may be nominally pursued to the very day.

It is the common practice of our breeders of horses to knock or punch out their temporary incisive teeth with a view of prematurely developing the permanent; but, though it certainly appears to accelerate the process, their artifices are unavailing, so far as they are executed for the purpose of deception or fraud, with one who has paid practical attention to the subject; for it is not in the power of art to make a horse, foaled in the regular breeding season, appear to an experienced eye one year older or younger than he really is; and conse-

quently all its ingenuity and effort amount to nothing but vain and cruel experiment. It is more particularly between the third and fourth, and fourth and fifth years, that this artifice is practised; it being an affair of great pecuniary consideration with the breeder to sell his three-year-olds for four-year-olds, or them, the following year, for five-year-olds; or if the breeder dispose of them to the dealer before this age, the latter seldom makes his transfer to the public, if he keep them long, without exercising his craft for similar ends.

Dentition is generally attended with more or less turgidity and tenderness of the gums, but seldom to a degree to be productive of pain or inconvenience: when the soft palate, during the cutting of some of the anterior incisores, is the part principally affected, the horse is said to have the *lampas**.

On the Changes which the Teeth undergo.

No sooner have the teeth arrived at their proper level in the mouth than certain natural changes commence, by the careful observation of which we may, with considerable exactitude, prosecute the animal's age to an advanced stage of life.

A fresh-cut tooth has, projecting from the outward part of its face, a sharp, waving border of enamel, from which the surface slopes in a shelving manner inwards, there being on the other side no equally prominent boundary: the pit, which is in consequence defective upon the inward side, is open, deep, and as yet unstained and free from extraneous matter. In the course of the ensuing year, the inward border grows upon a

* For information on this subject, vide Lect. "On the Mouth."

level with the outward, and takes its share of attrition; and now, first from the outward edge, then from it, the doubling of enamel is erased, and two elliptical enamelled rims become apparent, one of which borders the face, the other margins the pit: the pit itself is completely walled in, and soon becomes more or less blackened by some earthy incrustation, or any dirt or alimentary matter that may collect within it. In the course of the third year from the eruption of the tooth, the rims are worn down smooth, and the pit, both from attrition and the process of consolidation, (which is always gradually going on in the interior of the tooth,) becomes contracted, and almost closed or, to use the common expression, *filled up*, leaving but a small depression from which the mark is erased*. That the infundibulum does not close and disappear either from wear or internal deposition alone, but from both these causes, is evident, I think, from examination of the teeth, for, in regard to the first, the bare inspection of them *in situ* will convince one that they have shot from their sockets without having proportionately augmented in length; and, in reference to the last, if the teeth be removed, they will not only be found to have grown heavier, but actually thicker in substance, and somewhat altered in shape. This piece of knowledge ought to set us right about the appearance and disappearance of the marks†, and enable us to explain the origin of those anomalous mouths that give rise to so much alter-

* This depression is still surrounded by a prominent lip of enamel, which, in the course of years, gradually contracts, approaches the inward border of the face, grows round, becomes less distinct, and at length vanishes altogether.

† By which I mean the *bean*, or black incrustation lining the pit

cation and cavilling among those who are totally uninformed on the subject. If it exclusively depended upon natural causes, that timely uniformity so universally displayed where they are not interfered with, would doubtlessly shew itself here; but as the change is one produced by wear, surely we ought not to feel surprised at the many departures from the regular process, or be at a loss to account for them! But, the truth is, that the number of anomalies is by no means so great as it is too generally thought and represented to be, and that this discouraging report has had its origin in the little attention that has hitherto been paid by us to the subject.

In the course of the fourth, fifth, and sixth years, the front incisores undergo and complete these changes; during the fifth, sixth, and seventh, the middle teeth; and during the sixth, seventh, and eighth, the lateral teeth: so that from the fifth to the ninth year, the formation and rasure of the rims, and consequent levelling and planing of the face, and the contraction and closure of the pit, and subsequent disappearance of the mark, are our criteria of age. To illustrate this by example—of a horse five years old *, the face of the front incisor is level and smooth, a depression is visible in the site of the pit, but the mark is effaced from it, the middle incisor has completely formed rims, and they are level with one another, but its pit, though not so broad or deep as that in the lateral, still remains—in other words, it exhibits precisely the same aspect that the front did in the foregoing year; but of the lateral tooth

* Which he is from the completion of the fifth year until the return of the *first* of May.

the inward rim is still imperfect, the outward one waving or irregular, and the pit broad and deep: in fact, its features altogether resemble those the face of the middle had during the fourth year.

Even the temporary incisores proceed through these changes, and with more regularity, though they require much less time to perfect them, than the permanent. The front nippers of the foal are worn smooth by the time the lateral are developed—about the tenth month; the middle become so about the twelfth, and the lateral about the fifteenth month; at the age of two years, all the marks are effaced. There is this advantage in bearing in mind these few particulars relative to the temporary teeth—that we may not commit our judgment into the hands of the breeder by mistaking a yearling for a two-year-old, or *vice versâ*: this, to some, may appear infeasible or ridiculous; but I have heard such erroneous opinions given by those who have contented themselves with a survey of the exterior, when the animal has been much above or below the ordinary statue of foals of the same year.

Although this is the common course of the first series of changes in the aspect of the posterior incisores, instances of deviation from it are by no means wanting: at the same time I wish it to be understood, that they are not so numerous as we have been led to believe, and that by attention and skilful examinations we shall often be enabled to detect age under appearances that puzzle or deceive a common observer. To these varieties the front teeth are most subject; the lateral, least so; which I ascribe to their comparative utility and consequent attrition and wear. Every now and then we meet with mouths in which the marks are

obliterated from the front and middle incisores in the sixth year, whereas others present marks even when they are known to be aged: the lateral teeth in many cases lead to a detection of this fallacious aspect, when they themselves partake of it, still other signs are not wanting to aid us to rectify our conclusions.

Notwithstanding the teeth of the anterior jaw generally appear first, they retain their marks for several years after the faces of the posterior incisores have lost all vestige of them; but this seeming paradox admits of solution, when we remember, that their pits in the first instance are nearly twice the depth of the others: in addition to which, I believe, that the posterior teeth wear faster than they do, in consequence of their outward edges being so impressed, particularly in grazing, in the act of vellication and division of the growing herb.

"Monsieur St. Bel, the late professor of the English Veterinary College, used to assert, that after eight years the cavities in the anterior or upper incisive teeth *filled up* with equal regularity, thus from eight to ten the front ones were filled up, from ten to twelve the two middle, and from twelve to fourteen those of the corner*;" whereas a continental writer, whom I shall name hereafter, avers, that the front teeth of the anterior jaw are planed by attrition, and their pits obliterated, in the ninth year, those of the middle in the tenth, and those of the lateral in the eleventh. For my own part, I have always regarded the anterior jaw with considerable suspicion in determining age after the fifth year; at the same time, I must acknowledge

* Rees's *Cyclopædia*.—Vide "Age," in Horsemanship.

that I am in the habit of examining it in ambiguous cases from the ninth to the twelfth year, and that I occasionally find my opinion confirmed by the successive disappearance of the marks within that period.

Another but not less deceptive criterion of age is the aspect and form of the tusk. It is the common practice to minutely inspect the tusk after the fifth year, and, with very many horsemen, mainly to rest their opinion upon the condition of it; so far am I however from placing reliance therein, that I look upon it as the *res fallacissima* in showing the progress of age. This tooth in the male generally arises, with the lateral incisores, between the fourth and fifth years; but it is by no means constant in its appearance at this age; it has been seen between the third and fourth years, now and then it remains in its socket until the fifth year is passed: in all cases it requires twelve months for its complete evolution. About the expiration of the seventh year, the point of its cone is blunted and rounded off; about the eighth, its spoon-like furrows, from its growing convex inwardly, become superficial; and about the ninth, they are completely filled up and obliterated. After this, it gradually decreases in length, but at the same time grows bulky, and acquires in the end a cylindrical form, and is then said to have become *round*: but the period of this transformation varies so much in different individuals that in no case should our opinion be grounded thereon.

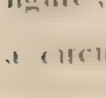
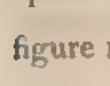
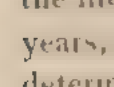
English writers on this subject—from the earliest down to White—appear to have transcribed their accounts, which were originally derived from the ancient authors, almost word for word, one from another: they proceed generally to the eighth or ninth year, and then

wind up the inquiry by saying, that horses that have passed that time of life are *aged*; far from a design to tax them however with any such meaning as the word literally conveys, I take it merely as an import, that "the marks are out of the horse's mouth," or that he has passed that period beyond which, it is generally believed in this country, no account can be rendered of age by inspection of the teeth—as the French express it, *hors d'âge*. The continental writers, on the other hand, have long given themselves credit for discriminating ages to an advanced stage of life; and I must confess I feel some surprise that no professional man among us has searched their works, and put, what appears to me to be, not only much novel but much valuable matter of fact, into an English dress. Surely it is a most desirable thing in our daily practice to be able to tell, even within one year or two, age until the twentieth year, thereby enhance our opinion and set it above that of a groom or jockey, and probably it may strike some as a little discreditable to us, that, while every branch of human medicine in this country, though comparatively so vigorous and luxuriant of itself, is still enriched with the flowers of the continent, the veterinary art should continue so much in arrears! But to return, although our writers may have used the word, *aged*, with the meaning I have affixed, it certainly has warped and mis-fashioned the public opinion, for nothing is more common now-a-days than to see horses rejected, without any inquiry into their general condition, purely because *the marks are out of their mouths*. So directly at variance both with reason and experience does this practice appear to me, that I will venture to assert, that a horse that has not been abused while young, is as

able—ay, many abler—to undergo trials of strength and labour at the ninth year as he was prior to it, and from that year to the twentieth, can perform more work than he has done during the former part of life. In proof of this (did my limits admit of it) I might inquire into the ages of studs of hunters, stage-coach horses, cavalry horses, &c. among which, I believe, it will unexceptionably be found, that an *aged* horse, if he have not been ruined in constitution or crippled in his early years, will withstand as much, if not more, fatigue than one that has just attained or past the adult period. If it be true then that horses that have been well treated while young are able to do more work after the eighth or ninth year than they have done before it, it follows that a knowledge of their subsequent age cannot fail to be of great value to us; in order that we may be enabled to calculate, with a degree of precision, the probable number of years they may continue to be useful.

The observations I am about to offer on this part of our subject, I derive from a translation of a German work, the production of M. Pessina, Professor and Director of the Veterinary Institution at Vienna; which evinces much patient and laborious practical research, and appears to have been drawn up, under very favourable auspices, with considerable accuracy and ingenuity. I think it right however to preface these observations with a paragraph of Lafosse's, which certainly contains the pith and marrow, and seems to have been the foundation, of Pessina's doctrine: it runs as follows—

"In order to tell the age of a horse that has past his eighth year, we must know that an incisor, considered as a whole, removed from its socket, is of a curved pyramidal figure, whose outline it is difficult to trace

by description, but, regarded *in situ*, the part exterior to the gum will be found to be oval, after this manner , and to continue this shape from the completion of its borders to the tenth or eleventh year, during which period however it approaches the succeeding figure, from this to the fourteenth year, it approximates a circular figure,  from the fourteenth to the seventeenth, it has a triangular figure,  , from which epoch it takes on and ever afterwards retains an oval figure reversed, so  ."

Let us now turn to the minute and circumstantial details of Professor Pessina. He systematically divides the lifetime of the horse, which he computes at thirty years, into six periods, that take their rise from and are determined by an equal number of changes the teeth naturally undergo in regular succession.

The first period is that during which the animal retains all or any of his milk teeth: it extends from birth to the fifth year.

The second period includes the sixth year, and continues so long as the marks remain visible upon the faces of the posterior incisors: consequently, (with reference to what has been heretofore stated,) it lasts for the space of three years with every pair of them. After showing the erasure of the outward and inward borders, and the obliteration of the mark, in which I need not follow him, the Professor concludes in remarking, that in many instances, and especially among horses who

* "Manuel d'Hygiénique," par Eduard Parlemonteux Lafosse, p. 151.

have been kept at pasture, the faces of the front teeth, and sometimes those of the middle, are worn off earlier

The third period is that during which the teeth retain the oval form. As the pits and marks degenerate, the face slowly and gradually undergoes a deviation of figure, from that of a pretty regular ellipsis, whose long to its short axis bears the proportion of 6 to 3, to an irregular one in which these proportions are as 5 to 4. This period requires on an average the space of six years for its completion: the front teeth enter it in the seventh and conclude it at the expiration of the twelfth; the middle pass through it one year later; and the lateral, one year later still.

In the fourth period the faces of the teeth assume a circular figure, and hence have been denominated *round*. At the commencement of it, the breadth of the face to its thickness is as 5 to 4; at the conclusion, it measures, in an inverse ratio, as 4 to 5: about the middle of it, the diameters are equal. This period also endures six years; so that the front teeth, which enter it on the thirteenth year, complete it by the expiration of the eighteenth; the middle follow one year later; the lateral, one year later still.

During the fifth period the face deviates by slow degrees from the round, and passes into the triangular state. In the beginning, its thickness exceeds its breadth as 5 does 4; in the end, as 6 does 3. It is the professor's opinion, but as yet it is unconfirmed by experience, that this period likewise, on an average, includes a space of six years; the front teeth therefore complete it with the twenty-fourth, the middle with the twenty-fifth, and the lateral with the twenty-sixth year.

The sixth and last period is one in the course of which an additional angle is projected from the ante-

rior or inferior part of the tooth. Pessina distinguishes it by the epithet *triangular*. From the paucity of the number of horses that are met with so old, and from the wear that the teeth have by this time undergone, no writers on age have ventured thus far in their accounts. Pessina never met with a horse that had lost his teeth from age, but he has seen their faces elliptical contrariwise, looking outwards or forwards. This period is unlimited.

That there is a natural change going on during life in the figure of the face, along with a variation in its relative dimensions, it is certain, as well as that the tooth sustains a continual loss of substance from manducation and mordication; but whether these effects proceed uniformly with increasing years, it is not certain. Supposing that it were so, the division of life into six periods is not without foundation, and is even practically useful.

The pit of an incisor is about four lines in depth, and is filled or levelled in three years, but it is not thence to be concluded that the body shortens four lines. An incisor is about 24 lines, or two inches, in length, supposing, then, that every year one line wears away, the tooth will be diminished half an inch in every period. And if you make half-inch sections of a perfect tooth, the faces and proportions of its various parts, will elucidate these changes.

Most reliance is to be placed upon the lateral teeth of the posterior jaw. They appear last, are ground down last, and are consequently less operated on by mechanical causes; they are also more protected from wear by their situation.

In computing age by this method, the period of life is first to be ascertained, the single years may be cal

culated afterwards by a careful comparison of one pair of teeth with another. The enamelled border of the pit, which, I have stated, takes on analogous figures so long as it remains, will serve to guard us against deception by any artifices that may be practised on the exterior border.

In the anterior jaw, the marks disappear from the front teeth in the course of the ninth year; from the middle, in the tenth; and from the lateral, in the eleventh. What progress these teeth have not made in transformation during the second period equivalent with the posterior, they gain in the third: notwithstanding the depth of pit, their proportions are then the same. They continue three years longer in the second, and consequently are only three in the third period; so that by the twelfth year, the third period is completed by the front teeth, and so on. During the fourth, fifth, and last periods, the changes are alike and equally perceptible in either jaw. So far PESSINA thinks that the anterior teeth are entitled to an equal share of our regard; though, in the generality of cases, they need not be inspected: they ought never to be passed by, however, when doubt hangs over the case, and more particularly in the ninth, tenth, and eleventh years. In such a remarkable manner the lateral teeth wear away, that they often put on the appearance of having been notched or indented.

In regard to the tusk, PESSINA remarks, that he has found the least regularity in its changes of any tooth. The very facts, that they are not in all horses cut at the same age, that they have little or no attrition against each other, and that they are worn by the tongue and food, sometimes much, sometimes little, would lead one

to draw conclusions from them with extreme caution in fact, as indications of age they can only be trusted to when they accord with the incisores. The tusk makes its appearance by the fifth, and is completely evolved by the sixth year. In the seventh, the apex of the cone is worn off. In the eighth, its furrows grow shallow; and in the ninth, they are obliterated. Then it gradually wears away; in the twelfth year it becomes round, from which time, though it grows shorter, its shape varies but little. But it is not uncommon to see it blunted like an acorn in the ninth year, nor to find it still pointed in the sixteenth or eighteenth.

Pessina concludes his account of the changes to which the teeth are subject, by observing, that, as they are dependant on wear, which is no *law* of Nature, but an effect of mechanical and accidental causes, they cannot, but under certain limitations, be implicitly relied on.

I shall now subjoin a translated extract from a French veterinary periodical pamphlet * that has made its appearance with the present year, which will show how far the professors of the School at Alfort, whose united opinions it breathes, tread in the steps of Pessina, and, at the same time, serve as recapitulatory of the principles—for there they agree though they are at variance in the periods—upon which the German professor has built his ingenious system of ages.

"At eight years of age (in most horses) the rasure—the disappearance of the marks—is perfect; the teeth

* "*Nouvelle Bibliothèque Medicale ou extrait d'un Recueil de Medecine Veterinaire. Chez l'Auteur.*" Just as the Lecture were going to press, Mr Sewell, with his usual kindness, sent me this number

are all oval; the central enamel * upon the face is triangular and nearer to the outward than the inward border, and the cul-de-sac of the cavity of the tooth appears within the outward border like a yellowish band carried from one side to the other †.

" At nine years, the front teeth grow round, the middle and the lateral contract their oval faces, and the central enamel diminishes and approaches the inward border.

" At ten, the middle teeth grow round, and the central enamel has approximated the inward border and is rounded.

" At eleven, the middle teeth are rounded, and the central enamel is almost worn off the posterior incisores.

" At twelve, the lateral teeth are rounded, the central enamel has quite disappeared ‡; the yellow band, grown

* The inner rim, surrounding the infundibulum.

† " It is not of so deep a hue as the other bony part of the face, doubtlessly because it has not existed so long. For it has been remarked, that the bony substance turns yellow with age: in very young teeth, it is milky white."—*Loc. cit.*

" Prior to the destruction of the first of these marks—the central enamel—when it is approaching the oval figure, the cul-de-sac of the cavity of the pulp makes its appearance anterior (or inferior) to it, along the outward border of the face, in the shape of a zone, at first yellowish and running broadwise, then round and greyish, afterwards white and extended from before backwards. It essentially differs from the first mark in never becoming prominent, but is always upon a level with the rest of the face; it is observed also, that it does not wear away, or, if it does, that a little, round black cavity is found in the place of it." *Letter from* M. Girard *to* M. Tissier.

‡ " This happens in all of them at the same time "—For, though the front teeth exceed in length the middle, and they the lateral,

wider, occupies the middle of the face, and the central enamel continues in the teeth of the anterior jaw.

" At thirteen, all the incisores are rounded, the sides of the front teeth spread out, and the central enamel continues in the anterior jaw, but is round, and approaches the inward border.

" At fourteen, the (faces of the) front incisores put on a triangular appearance, the middle grow out at their sides, and the central enamel of the anterior teeth diminishes; but it still exists.

" At fifteen, the front teeth have become triangular, the middle enter upon that figure, and the central enamel of the superior jaw is still visible.

" At sixteen, the middle are triangular, the lateral commence that shape, the anterior central enamel has generally *(souvent)* disappeared.

" At seventeen, the triangular figures of the posterior jaw are completed, but their triangles are equilateral until

" The eighteenth year. Then, the sides of them lengthen in succession from the front to the lateral teeth, in such a manner that

" At nineteen, the front teeth are flattened *(aplaties)* from side to side.

" At twenty, the middle have taken on the same shape; lastly,

" At twenty-one, the lateral teeth assume it."

Leaving these doctrines of the continental professors to the tests of further observation and experience,

and their infundibula are of proportional depth, as the first are worn down two years, and the second one, before the lateral, it follows that their pits, which are of equal depth when the lateral are cut, are all obliterated at one time.

which can only be decisive upon a large scale and under certain favourable circumstances, and to the comments of those who may have already reaped the scientific advantages of such situations, I shall now briefly advert to the after-growth of the teeth, and conclude this lecture, which has already become extra-limited, with some few remarks on old age.

That there is an after-growth or continued accretion of the teeth, observes PESSINA, is evident and indisputable; were there not, the gums in the course of time would have to grind the food; for wear or destruction of their faces is going on without intermission, and with more or less regularity according to circumstances. I would advance as additional proofs, that the enamel that encases the body of the tooth can only disappear by a process of destruction, no more than that which lines the pit, and that the circumstance of their concurrent gradual diminution shows that the seat of wear is the face; so that in old horses the incisores have no enamel, inside or outside, and hence their yellow aspect and disposition to tartareous incrustation.

The professor estimates the wear according to the kind or breed of the horse; in one that is thorough-bred, at one line *per annum*; in others, at one line and a half. And it appears that the shoot from the jaw is about equal to this; so that the original length of every tooth is still preserved. Whenever the consumption however is not equal to the growth, (the one a mechanical, the other a living process,) the aspect of the teeth can no longer be a criterion, or but a fallacious one, of age. then, as GIRARD (*fils*) remarks, the only method of rectification must consist in sawing off the teeth to their natural length.

Pessina has told us that the natural age of the horse is thirty: I must confess myself, I should have rated it higher. At all events, it is by no means uncommon, among horses that have been kindly treated, to meet with instances of greater age.—In the riding school at Woolwich, a horse, named Wonder, died, some years ago, at the age of forty; in the year 1822 a favourite horse of Mr. Watrond's, of Badfield House, Devon, died at fifty; and within the same year, a memorable instance of advanced age, a parallel of which, I believe, is not on record, took place in a horse belonging to the Mersey and Irwell Navigation, who died in his sixty-second year*!

I remarked in the last lecture, that the jaws in old age grew narrow and straight, projected with less bow downwards, and, as it were, crowded the incisores, and gave them a horizontal inclination, but they not only contract, they undergo (like the teeth at a less advanced period) a process of internal consolidation. For there does appear to be a time when the tooth ceases to grow at the root, though it still continues to issue from its socket and make up for the loss from wear; and the result is, that the fang shrinks and becomes pointed, and is carried upwards along with the tooth in the alveolus, whence it would loosen and fall out, were a process of interstitial deposition and contraction not set up in the jaw, by which it is constantly embraced, and still held immoveable and firm. At this time, the teeth, as if they were squeezed together, grow flat at their sides, along which they are in close

* The head of this animal would have been a most desirable present to a public *veterinary* establishment: it becomes comparatively valueless when it falls into indifferent hands.

contact, they stand out almost horizontally from the jaws; they are longer, both because their wear appears to be less in that position, and because the gums shrink from their bodies; they take on a sickly yellow hue, and are often, about the gum, incrusted with a substance like tartar; the outer edges are more or less worn, giving the faces a variety of shapes; and the teeth of the anterior jaw, still farther over-hang their opponents.

Accompanying these, there are many signs of age unconnected with the teeth. The head grows lean and fine; the features look more striking; the hollows over the eyes deepen; the eyes themselves grow irritable and twinkle; the cheeks become lank; the gums and soft palate, pale and shrunk; the submaxillary space is capacious; and grey hairs make their appearance in various places, more particularly over the eyes, and about the face. In regard to the body generally, it also makes a more striking display of its shapes than in any former part of life: the neck grows thin and fine; the withers grow sharp, and give an appearance of increased length and obliquity to the shoulder; the back sinks; the quarters assume a more blood-like turn, and seem to lengthen; tumors of all kinds—spavins, splints, wind-galls, &c. generally become in part or wholly absorbed; the legs feel sinewy and free from puff, though they evince instability and weakness. Now-a-days it is not often however that we meet with horses thus advanced in years, still more rarely with any that have grown decrepit from age.

LECTURE XXVI.

Particular Descriptions of the Muscles.

HAVING, on a former occasion*, taken a cursory view of the structure and economy of these organs in general, I shall, in this and the following lectures, direct my attention to them as they appear on dissection.

In describing any particular muscle there are four considerations to be borne in mind, two of which are indispensable, and the other two, or even one of them, but rarely lost sight of without manifest defect or unpairment in the description: the two first alluded to, are *attachment* and *use*; the two last, *figure* and *situation* or course. With regard to the first of these considerations attachment, it may be useful to repeat a sentence out of the lecture referred to below.—"That extremity from which it (a muscle) arises, commonly connected to some fixed or very limitedly moveable part, is called its *origin* or *head*; the other, implanted into the part to be moved, the *insertion* or *termination* of it, while the portion intermediate—between its head and termination—receives the name of *body* or *belly*." Although I shall

* Lect. xii. Part I.

endeavour to be as concise in my myological details as the nature of the subject will admit. I shall at all times amplify, and be minute in anatomical inquiry, when any important pathological fact can with advantage be illustrated; and, indeed, at one time so resolved was I to be guided by this consideration, that I had excluded from these lectures many muscles of minor interest, as being rarely or never implicated in disease: subsequent deliberation, however, has led me to doubt that a course of anatomy thus constructed, is sufficiently solid groundwork for a veterinary student!

Concerning the nomenclature here adopted, as I profess to follow, so long as the analogy can be pursued without incurring the risk of impropriety or misconception, that at present in most popular use in human anatomy, I may have introduced some innovations: all that I can say in justification of myself, is, (for I admit that the practice is reprehensible,) that we have no written authority of sufficient importance to bow to, and that I have spared neither time nor pains in my dissections, and that therefore I have ventured, always keeping my standard in view, to affix, what I conceived to be, to every muscle the most appropriate appellation.

As a pupil at St. Thomas' Hospital, I remember to have reaped several advantages from the classification of the muscles (and more especially of those of the neck and back) into *regions:* I found them with more facility, I understood better their relative situation, and I had less difficulty in retaining their points of attachment in memory. And I cannot doubt, if my attempts at a similar distribution of those of the horse should prove happy, that equal assistance will be afforded by it to the juvenile veterinarian. But there is one muscle which defies any arrangement of this kind—one

that not only extensively clothes the trunk, but pervades the neck, and even spreads its fibres upon the head this, in conformity with custom, I shall commence my myology with.

Panniculus Carnosus.

A CUTANEOUS muscle peculiar to quadrupeds, which formerly, from its close connection with the skin, was regarded as one of the external coverings of the body, we shall find, however, in the dissection of it, that their attachment is purely cellular, consequently that they are, in an anatomical point of view, two perfectly distinct and separate parts. This pair of muscles, or, as SPURZHEIM calls them, "the fleshy panicles," are spread over, or clothe as it were, the lateral parts of the body, extending forwards upon the shoulder, along the neck, to the head, and backwards upon the belly as far as the stifle. The integument covering the abdomen adheres to the muscle thereabout by a quantity of cellular membrane, which, upon the central parts of it, is of a close and dense texture, and binds the skin with extreme tenseness, but upon the sides it is loose and plentiful, and towards the posterior part of the belly forms a thick and distinct layer that corresponds to what is named in human anatomy the *fascia superficialis*. In prosecuting the dissection from the middle of the belly to the sides, we find immediately underneath, and in some places intermingled with, this cellular membrane, a thin layer of muscular fibres belonging to the panniculus.* This cellular envelope is principally

* The panniculus is much blended with the fascia superficialis they must be both taken off with the knife in order to lay bare the fibres of the external oblique muscle

formed by a separation of the layers of the fascia superficialis, which, after having given a covering to the penis and testicles, is continued down upon the inside of the thigh. These remarks will prove of some assistance in tracing the disposition and connections of the abdominal portion of this muscle, which is too often but imperfectly displayed, in consequence of not having paid sufficient attention to the preparatory or cleaning stage of the dissection.

Origin. The attachments of this muscle are chiefly cellular; though in some parts of it tendinous fibres are very demonstrable. Its most anterior origin is, by means of a few pale disgregated fibres, some of which may be traced as high up as the root of the ear, from a thin fascial expansion covering the muscles upon the side of the face. These scattered fasciculi become strong and convergent about the angle of the jaw; but, having quitted this part, they are again spread out and scattered over the anterior and lateral parts of the neck, blended, on either side, with the fibres of the levator humeri, and intimately united with the fasciæ of these parts. From this, which may be called its *cervical portion*, some little fleshy bundles are seen running to the spine of the scapula, to which they are loosely attached by abundance of cellular membrane; others, paler and less distinct, are continued down over the shoulder-joint, where they become embedded, and many of them lost, in cellular and adipose substance: the unexpended fibres may be traced onward into the fascia of the arm. From these attachments—*viz.* the cellular and fascial investments of the lateral parts of the head and neck, the spine of the scapula, and the fasciæ of the shoulder and arm, is formed a broad but thin fleshy expansion

upon the side, the fibres of which take a direction, upwards and backwards, to the spine, to which, although they may be said to be continued by the intervention of fascia, they are not immediately fixed, no fleshy fibres ascend higher than the top of the scapula. This, the *thoracic portion* of it, gives a covering to the side of the chest, though in some places it is extremely pale and indistinct. Upon the posterior and inferior parts of the belly its fibres converge into a tendinous band, which is continued, by means of a tendinous and cellular elongation, into the fascia covering the stifle-joint, whence a portion of it is reflected inwards to the pubes.

The fibres of the panniculus are strongest just behind the scapula, and upon the more prominent parts of the belly. They adhere to and conceal many other muscles, the principal of which are—the obliquus externus abdominis, latissimus dorsi, postea et antea spinati, and parts of the triceps and serratus magnus. Anteriorly it is so intimately blended with the levator humeri, that there is much caution required in the dissection, otherwise one will be reflected with the other. Its fibres are also mingled about the breast with those of the pectorales.

Insertion. Into the skin that every where covers it, chiefly by the interposition of cellular membrane: this membrane, as I have already shown, varies in texture and quantity * in different parts, and here and there is traversed and strengthened by ligamentary cords.

Use. These muscles serve to give motion to, and to corrugate, those parts of the skin into which they are inserted: the skin itself being incapable of such con-

* This will depend in some measure on the condition of the horse. Vide Lect. ix. Part I.

traction, is thrown into folds that form right angles with their fibres. The chief points from which they act are, the angle of the jaw, the scapula, the patella, and the pubes. By suddenly and repeatedly wrinkling the skin, the horse (unprovided with hands for the purpose) startles, and thus dislodges, those insects with which during the summer months he is continually infested: he has also the power with it of displacing foreign bodies of inconsiderable weight or magnitude from his coat, such as dirt, prickles, hay-seeds, &c. and of resisting, to a certain degree, the gripe or bite of an adversary. So habitual indeed does this cutaneous action become, that the panniculi seem often to contract involuntarily, or at least unheeded by the animal, on the application of any irritant: this is particularly remarkable when a horse that is grazing or feeding is annoyed by flies. M. GIRARD thinks, that it adds to the power of those muscles which it braces much when in action *.

Muscles of the Trunk.

ABDOMINAL REGION.

AFTER having dissected off the panniculus carnosus from the abdomen, together with the cellular membrane in which it lies embedded, several white tendinous lines, running in different directions, come under our notice. The one that extends from the ensiform cartilage to the pubes, has received the name of *linea alba*: it marks the place of junction of the tendons of three pairs of abdominal muscles, and is perforated near the middle by the

* — "Il concourt à augmenter la force des muscles sur lesquels il exerce une pression un peu forte" *Anat. Vet.* p. 233. tom. I.

umbelicus or navel, through which in the fœtus passes the *umbelical cord*. On either side of this line is another, taking a curvilinear course, called the *linea semilunaris*: this is the line of demarcation between the *oblique* and *transverse* muscles and their tendons---denoting where the one substance ends and the other begins. Running transversely between these are several white lines, to which the name of *lineæ transversales* is given: they consist, as will hereafter be seen, of so many tendinous intersections in the *straight* muscles.

There are four pairs of muscles of the abdomen:---two pairs are *oblique*, one *transverse*; the fourth is *straight*: in the human subject, a fifth pair is generally present, called the *pyramidal*.

Obliquus Externus Abdominis.

This muscle is covered by a tendinous expansion, called the *aponeurosis of the external oblique muscle*, which must be carefully dissected off in order to bring into view its fleshy fibres, but so intimately is this substance united at the linea semilunaris with the tendon of the muscle, that they will not admit of entire separation by the knife.

Origin. By finger-like, fleshy processes, called digitations, from the posterior edges of the fourteen hinder ribs, near to their cartilages---digitating with the serratus magnus and intercostal muscles—by tendinous fibres, from the posterior spinous process of the ileum, and from the *fascia lumborum**. From these attachments

* A strong ligamentous fascia, attached to the spinous processes of the lumbar vertebræ, and to several of the hindermost dorsal: it invests the superficial muscles about the loins.

its fleshy fibres, which regularly increase in length from its anterior to its posterior border, run obliquely downwards and backwards, decussate in their course those of the internal oblique, (the layer of muscle above them,) and at the linea semilunaris send off a tendinous expansion of great breadth.

Insertion. Into the entire length of the linea alba.

The portion of this muscle which arises from the posterior spine of the ileum, is particularly worthy of remark; from it proceed two elongations of tendon, one of which, comparatively thin and weak, is stretched across to the pubes, where it is firmly fixed; this constitutes what surgeons call *Poupart's ligament:* a part, however, by no means well defined in the horse. The other process of tendon, much stronger, is continued down upon the inside of the thigh. At the posterior and lower part of the belly, on either side, we perceive a round opening in the aponeurosis and tendon of this muscle; this is the *abdominal ring:* through it in the male the spermatic cord passes from the cavity of the abdomen into that of the scrotum; in the female, it gives passage to the round ligament. This aperture, which is formed by the division of Poupart's ligament into two columns, is at first but indistinctly seen, from being invested by some cellular and adipose substance that connects the cord to the surrounding margin of it. At this part the aponeurosis is much strengthened by numerous transverse tendinous fibres, which run from the linea alba towards the spine of the ileum.

Use. The uses of these muscles are—to contribute largely to the formation of the under and lateral parts of the abdominal parieties, and to give support to the contained viscera; to compress the bowels occasionally, and

by that means assist in the evacuation of fæces and urine, and in the expulsion of the fœtus; to diminish the cavity of the chest from before backwards, by thrusting the *diaphragm* forwards, through the medium of the abdominal viscera, and from side to side by laterally compressing and retracting the ribs. To see these muscles in action we have only to observe a horse in the act of voiding his fæces; or, one whose respiration has become laborious: the animal draws or tucks up his flanks by the contraction of these and other muscles; he works or heaves at the flanks by their alternate and forcible contractions and relaxations.

By reflecting the external oblique---from its origin--- we expose the

Obliquus Internus Abdominis.

The fleshy fasciculi of this muscle are spread out in the shape of a fan.

Origin. Its fleshy fibres collected together, arise from the spine of the ileum, covered by those of the external oblique; from which point they radiate in a contrary direction---downwards and forwards---and terminate, with great regularity, in a semicircular border.

Insertion. From this border is sent off a broad thin, tendon, which at the linea semilunaris becomes inseparably united with the aponeurosis of the external oblique: here it splits into two layers of which--the external, the stronger one, is inserted into the cartilages of all the false ribs, into the cartilago ensiformis, and the linea alba; the internal, consisting of some thin scattered fibres, accompanies the tendon of the muscle next to be described.

Use. These muscles will assist the former in action.

as well as in sustaining the viscera; they will have more effect however in the expulsion of fœces and urine than as muscles of respiration: they are particularly called into action when the flanks are much tucked up by any violent efforts.

Transversalis Abdominis,

Is a thinner and broader muscle than the last described, and one that closely invests the abdominal viscera.

Origin. Fleshy, from the inward surfaces of the cartilages of all the false ribs—digitating with the fleshy fibres of the diaphragm—from the fascia lumborum, and from the anterior spine of the ileum. Its course, as its name implies, is directly across the abdomen: it is wholly tendinous at the linea semilunaris, and enters into inseparable union with the internal division of the tendon of the internal oblique.

Insertion. Into the ensiform cartilage, and into the entire length of the linea alba.

Use. The transversales and the oblique muscles in supporting the viscera, and are more advantageously placed to effectually compress them, thereby, they are doing much towards the evacuation of the bowels, as well as in the protrusion of them against the diaphragm *.

Rectus Abdominis.

This muscle, on either side, is enclosed within a

* The fleshy fibres of this muscle are continued further backwards than those of the internal oblique, but, like them, end in a round tendon that crosses over the cord in the form of an arch: this corresponds to the *crural arch* of the human subject.

sheath, constituted of the tendons of the external and internal oblique inferiorly, and of those of the internal oblique and transverse muscles superiorly. As has been stated, by a careful dissection, the tendon of the internal oblique may be seen to split into two portions at the linea semilunaris, one of which passes under, the other above the rectus; so that, in fact, the muscle itself is actually placed within the tendon of the internal oblique. The sheath in several places adheres firmly to the muscle, and its fleshy belly is intersected at those parts by portions of tendon, whose situation and course are denoted externally by the lineæ transversales. These are thin muscles of considerable length, and, as may be inferred from this remark, by no means powerful ones; they compose about one-third of the abdominal superficies.

Origin. From the cartilages of the seven posterior true ribs, and from the sternum. Thence it is stretched along the under part of the belly, bounded on the one side by the linea alba, and on the other by the linea semilunaris.

Insertion. Tendinous, into the pubes, near to the symphysis.

Use. The chief use of these muscles in quadrupeds, appears to be that of bracing the middle parts of the belly, and, thereby, of counteracting that tendency to relaxation which must exist from the constant dependance of the bowels: for this purpose, they are much broader, though thinner, than in the human subject. The recti will also have some effect in the compression of the bowels, and, by drawing the sternum upwards and backwards after inspiration, in the contraction of the thorax.

The cavity of the abdomen is closed directly behind

the abdominal ring by the internus obliquus and transversalis; under the crescentic borders of which the spermatic cord is taking its course along the *inguinal canal*, and entering the cavity by an opening at the upper part of it, called the *internal* abdominal ring. This aperture, let it be remarked, is not placed opposite to the external ring, but at the space of three inches from it outwardly, and somewhat anteriorly to it; no intestine therefore can protrude directly through the external ring; (at least I have never heard of any instance of it;) but inguinal herniæ in the horse are all oblique, *i. e.* they pass out of the abdomen at the internal ring, and proceed with the spermatic cord down the inguinal canal, through the external ring, into the scrotum.

If, with care, an incision be made through some of the posterior fibres of the transversalis, we shall find, that, instead of having laid bare the peritoneum, we have exposed an expansion of fascia of considerable density and firmness of texture: this part Sir Astley Cooper first described, and called the *fascia transversalis*. It may be traced, without much nicety of dissection, as an entire lining to the soft parts of the abdomen; and is, from the resistance it opposes, which is by no means inconsiderable, in the horizontal position of the trunk, of essential service in sustaining the burden of the dependant viscera; and, in so doing, reduces the demand for muscular action. In it is formed the internal abdominal ring.

Hernia.

By *hernia* or rupture is meant, the protrusion of some viscus---commonly intestine---and along with it a sac

or pouch of peritoneum, from the cavity of the belly. In the human subject there are many situations that have shown this disease, from which and from the nature of the protruded part, it has been distinguished into several kinds, and these have received appropriate technical appellations: the only varieties I have met with in the horse, are *bubonocele*, or inguinal hernia, in which the intestine* descends with the spermatic cord, along the inguinal canal, and lodges in the groin; and *oscheocele*, or scrotal hernia, in which the gut continues its course into the scrotum. When the contents of the swelling can be returned into the abdomen, the hernia receives the epithet, *reducible;* but when that is impracticable, either from considerable augmentation to their bulk, or from adhesions to the sac, or to one another, it is said to be *irreducible*. Should there be constriction at the mouth of the sac---the intestinal abdominal ring---so that the circulation is either impeded or arrested, the hernia is said to be *strangulated*.

Hernia is a much less common disease in the horse than in man, owing to the circumstance of the viscera not being upon those parts of the belly likely to admit of protrusion---the abdominal rings; indeed, in this country it is a rare occurrence, which, there appears reason to believe, is ascribable to the general practice of castration: I suspect however that we are not apprized of its existence in very many cases. For, if the horse be the subject of bubonocele, unless our attention be directed to it by symptoms of strangulation, we are not likely ever to discover it, and indeed oscheocele, it

* I believe the part protruded is unexceptionably *omentum*. The omentum of the horse is too short ever to become herniated.

the escaped portion of gut be but small, may be present through life without exciting even a suspicion of it. But if the hernia be large, it will be readily recognized by the sudden appearance of a swelling of considerable magnitude between the thighs, that extends for more or less along the belly, is tense and elastic, and perceptibly expansible, when softly compressed, from efforts in coughing. Unless there be any tendency to constriction, the only inconvenience attending these swellings appears to be their bulk.

The subjects of hernia we find almost unexceptionably to be, horses that have been overstrained by sudden and violent acts of galloping or leaping: the forcible retraction of the diaphragm displaces those viscera that lie within the confines of the ribs, the ribs, being tightly embraced by the girths at the time, are unable to yield and give more space laterally, the consequences are that the bowels are all thrust backwards, and that one of the guts (they being the parts most loosely connected) is protruded from the cavity. Thus it is, that racers that have undergone severe courses of training, and hunters, are the ordinary subjects of it. Mechanical injury to the belly will also sometimes give rise to hernia; of which I shall presently relate an instance.

In all cases of reducible hernia we can with facility sensibly diminish the bulk of the swelling, though I am not acquainted with any means but what mostly prove abortive in the permanent reduction of it. If it have arisen from an injury of any kind that is followed by inflammation of the parts, we ought to bleed, give purgative medicine, feed with hay chaff, bran mashes, and water gruel, and keep the swelling continually wet with the Liquor Plumb Subacet: Dil:

or spirit lotion, before we made any attempts to return the gut. When the tumefaction has subsided, and the parts have become soft and compressible, the reduction is commonly easily effected: indeed, the gut will now and then slip up spontaneously, as soon as the animal is cast upon his back. In this position a compress may be applied, and retained in its place by a broad and suitable roller. should this, which is difficult of adjustment, not answer the purpose, I should be inclined to rub a liquid blister over the scrotum*.

Mr. Hodgson, V. S. who has lately returned from India, where, for the last seven years, he has been professionally employed by the Company, has, at my request, kindly drawn out the following sketch of hernia, as it is met with there: it will be found to contain many practical hints, relative to strangulated hernia and the operation for it, well worthy of our consideration.

"In Asia, where it is not the custom to emasculate horses, inguinal hernia is of frequent occurrence: the animal is supposed to have the gripes. When strangulated, it generally ends in death. It mostly happens after sudden exertion; our inquiries about its origin, therefore, ought invariably to be particularly directed to that point. In strangulation, the symptoms resemble those

* In 1820, Mr C Percivall, V S 11th Dragoons, went to see a black cart colt *that had received a kick*, five days before, from another at straw-yard He found a large swelling along the posterior and inferior part of the belly, which was soft and yielding, as if it had been a bladder half distended with air He easily reduced it, and applied a compress and roller, bled and gave some aloes In three weeks, though considerably diminished in volume, the intestine was still very perceptible "After this, I *blistered* the part, and certainly with good effect, but the scrotum ever afterwards remained hernial."

of the colic or enteritis; in which disease, as well as in hernia, the testicles are drawn up; but in the latter case, only one is retracted, and that becomes turgid, and larger than the other, in consequence of the impediment to the return of blood at the ring. The portion of protruded intestine may be too small to be felt; but, if there be reason to suspect its descent, we must not await the approach of other and more decisive symptoms, but proceed at once to the operation; which should be performed in the following manner*.

"The horse ought to be thrown upon his back; the limb of the affected side then released from the hobbles, and drawn upwards by a rope, passing over a beam, so as to fix it in a position that may be varied at the pleasure of the operator." *This would be a most favourable time to employ the taxis. I would endeavour to confine him in this position, and then—having debilitated him and relieved the plethora of the parts as much as possible*

* That vomiting may be present with these symptoms, the case below informs us; and I should expect to find others, such as analogy would dictate.—costiveness—fulness, tension, and tenderness of the belly—altered pulse—expression of pain when the scrotum or hernial parts were compressed, &c.

"On July 22d, 1806, a strangulated intestinal hernia proved fatal to a tall stallion, surnamed *Le Coq*, one of the stud for experiment *(haras d'experience)* at the Veterinary School, Alfort; the animal only survived three days, during which his sufferings were extreme. Some moments before he sunk under this affection, *he vomited, at several ejections, a pretty considerable quantity of fluid*, consisting chiefly of the beverage that had been given to him."

"On opening his body, which was done immediately after death, the hernial portion of the small intestine was found gangrenous; the stomach contained much liquid matter, was pale, and so soft that it was torn through with facility." *Traite d'Anatomie Veterinaire*, par GIRARD. Vide *Memoire sur le Vomissement* p. 23

by one or two copious bleedings, prior to casting—I would cover the affected parts with powdered ice, or, could that not be procured, I would direct that several buckets of cold water be dashed upon the parts, or some refrigerant mixture be applied to them. If the gut could be felt, skilful compression of the parts (technically termed the TAXIS) *might reduce it; but whether it were perceptible or not, I would employ the taxis after the parts had lain an hour or more enveloped in ice, and if I found their volume much diminished, I would allow the animal to rise. The tobacco enema might also be made trial of.* "The operation, in itself a difficult one, is often rendered embarrassing and irksome by the struggles of the patient. Having made a small opening at the bottom of the scrotum, into the cavity of the tunica vaginalis, pass the finger up, along the cord, as high as possible; then, pressing the finger outwards, make a second incision through the skin so as to lay bare the point of it"—*now in the inguinal canal*—" and enable you to examine the parts. Should intestine be discovered, make every effort to return it into the belly, but if that prove impracticable, introduce a small bistoury, guarded at the point along the finger, and divide the stricture—in doing which great caution is required, that the dilatation made by the incision"—*which should be directed upwards, as the hernia lies*—"be *barely sufficient* to admit the recession of the gut, if it exceed this much, as soon as the animal struggles, fresh intestine, and more in volume, will present itself, and the operator find himself embarrassed, if not foiled, in returning and confining it, from the obstacles that oppose the application and retention of a truss or compress *.

* "In some cases the gut may be felt, when the finger is passed

"The Government of India have lost, in times past, a great number of horses from hernia: I believe that I first introduced this mode of operating, and I can safely say, that it has been the means of saving many. Out of ten cases of strangulation that came under my observation during the first two years, but four were lost: two died in which the disease was not known to exist before death; the other two fell victims to over-dilated strictures, whereby the guts could not afterwards be retained in the belly."

up; but, when it cannot, we are not to be deterred from proceeding. By making the incision at the *lower part* of the scrotum, not only is the operation rendered less difficult, but we have afterwards a dependant opening, in case of abscess, which is now and then a sequel of it. I have been informed that, V. S. Anderson, of the 24th Dragoons, after having opened the scrotum and reduced the hernia, was in the habit of employing the clams, but with what success I never heard."

P. S.—At the time that this Lecture was printing, Mr. Sewell showed me a horse in the College, that had a protrusion of intestine, about the size of a small apple, a little behind the cartilages of the false ribs, amid the fleshy fibres of the internal oblique and transverse muscles. Moderate pressure upon it, immediately reduced it, and then, with one or two fingers, the skin (which was loose thereabouts) could be pushed, through the opening, into the cavity of the belly. This adds another variety to the aforegoing description, and comes under the denomination of *ventral* hernia.

LECTURE XXVII.

DORSO-SCAPULAR REGION.

THE muscles of this region well deserve our attention, being three of the principal agents employed in the motions of the shoulder.

Trapezius.

IN grasping the withers we include this pair of muscles between our thumb and fingers. The trapezius is of a *triangular* figure, and is covered by a tendinous expansion, derived from the ligamentum subflavum *.

Origin. From the spinous processes of the third, fourth, fifth, and sixth dorsal vertebræ, and from the fascia covering them. Its fleshy fibres converge, run downwards and forwards, over the superior costa of the scapula, and there unite in a flat tendon.

Insertion. Into a little tubercle upon the spine of the scapula.

Use. It is an elevator of the scapula—it draws the scapula upwards, and, at the same time, inclines it backwards.

* Improperly called the ligamentum *nuchæ*.

Latissimus Dorsi.

PARTLY concealed by the trapezius. In figure not unlike the scapula itself, from the upper and back part of which it is extended to the back and loins.

Origin. By a broad aponeurosis, which is stretched over the posterior part of the back, and over part of the loins, from the ligamentum subflavum. Its fleshy fibres make their appearance upon a level with the top of the scapula, converge in their course downwards and forwards over the ribs, to which they are loosely attached * by cellular membrane, as well as to the posterior angle of the scapula.

Insertion. By a long thin tendon (which is connected with the teres major, along with it) into the inner and upper part of the body of the os humeri.

Use. To draw that bone backwards and upwards. By raising the lower part of the shoulder, it will much facilitate the motions of the scapula in progression.

Rhomboideus Brevis.

A BROADER and much shorter muscle than the rhomboideus longus, which I shall next describe.

Origin. In part concealed by the trapezius, from the four or five anterior dorsal spines. It passes directly downwards to the scapula, uniting in its course with the longus.

Insertion. Into the inner part of the superior costa of the scapula, and into the cartilage with which it is tipped.

* It does not *arise* from the ribs, as some have described it.

Use. To draw the scapula directly upwards, upon the withers.

HUMERO-CERVICAL REGION.

To guard against the multiplication of regions, I have been induced to class the two following muscles under this head.

Rhomboideus Longus.

A LONG tapering muscle, of a pyramidal figure, running along the side of the ligamentum subflavum. It is hidden from view by some fibres of the panniculus.

Origin. Which is the apex of the pyramid, from the side of the ligamentum subflavum, as high up as its attachment to the second cervical vertebra—continuing to arise from it in its course down the neck, and increasing in substance.

Insertion. Along with the rhomboideus brevis, into the superior costa and cartilage of the scapula.

Use. To assist in the elevation of the scapula, and to draw it at the same time forwards.

Levator Humeri.

A BROAD muscle spread over the side of the neck.

Origin. By a thin tendinous expansion, high up, from the tubercle of the occiput, and mastoid process of the os temporis, from the transverse process of the atlas, and those of the second, third, and fourth cervical vertebræ, and from the ligamentum subflavum, and fascia of the neck. From these different origins its fibres run obliquely downwards and backwards to the point of the shoulder, over the head of the os humeri,

to which they have a loose cellular attachment. It is also similarly connected hereabouts to several of the muscles of the shoulder, and blends its fibres with the cervical portion of the panniculus.

Insertion. Into the fascia covering the muscles of the scapula; thence it is continued down to be fixed to a ridge upon the body of the os humeri that proceeds from its greater tubercle.

Use. To raise and draw forwards the shoulder, and, with it, the arm; or, these parts being fixed, to turn the head and neck to one side. When both muscles act, they will depress the head.

It will be advantageous here to the dissector that I proceed with the dissection of the neck, leaving the regions remaining to be explored in the trunk, until I have described the muscles of the head. They are—the *pectoral*, *costal*, *sternal*, *dorsal*, *lumbar*, and *coccygeal* regions.

Muscles of the Neck.

LATERAL CERVICAL REGION.

Having reflected from its points of origin the levator humeri, we expose the

Splenius.

A very large mass of muscle, constituting the main thickness of the neck, the fibres whereof are taking an oblique course from the ligamentum subflavum to the cervical vertebræ. It is worthy of remark, that those fibres which approach the occiput are slender and fine, while those at a distance from it are strong and coarse. The whole muscle is invested in a thin tendinous fascia, which, in places, is so firmly adherent

that it cannot be cleanly dissected off but with considerable nicety.

Origin. By tendinous fibres---from which is sent off its aponeurotic investment---and by fleshy ones, from the ligamentum subflavum, as high up as the occiput, and as far back as the fourth or fifth dorsal spine.

Insertion. By as many large fleshy packets, into the transverse processes of the six lower cervical vertebræ, and by flat tendons, into that of the atlas, and into the mastoid process of the temporal bone.

Use. To uphold the head and neck and to erect them, when the pair act. One contracting alone, will incline those parts to one side.

Complexus Major.

Between the splenius and ligamentum subflavum, adhering to the latter by a fine cellular tissue, lies this muscle, the largest of the neck. It is broad and bulky upon the lower part of the neck, round and collected as it approaches the occiput. Its fleshy fibres are intersected in many places by narrow slips of tendon, and are taking a different course from those of the splenius.

Origin. By short tendinous slips from the spines of the four or five anterior dorsal vertebræ, and from their transverse processes, also from the transverse processes of the lower five cervical. Its fasciculi run forwards and upwards, congregating as they ascend, and end in a flat tendon.

Insertion. Into the tubercle of the occiput, by the side of the ligamentum subflavum.

Use. This is one of the most powerful pair of those muscles that are---one or more of them---in continual action to uphold the head and neck. It will, contract-

ing to its utmost, forcibly erect the head, and, by pulling the occiput backwards, produce that appearance called the *cue neck*. The splenius and it often co-operate; but the action of the former is more confined to the neck.

Complexus Minor.

A SMALL muscle contiguous to the ligamentum subflavum, lying buried between it and the round or anterior portion of the major.

Origin. From the spinous process of the vertebra dentata.

Insertion. Along with the complexus major, from whose tendon its termination is inseparable.

Use. To assist that muscle in erecting the head.

Rectus Capitis Posticus Major.

A LARGER muscle than the former, underneath which it is taking a similar course. It is attached to its fellow by cellular membrane.

Origin. From the spine of the vertebra dentata.

Insertion. Into a scabrous pit in the occiput, below its tubercle.

Use. To pull the head backwards, and, in doing so, project the nose.

Rectus Capitis Posticus Minor,

Is placed immediately below the major.

Origin. From the upper part of the body of the atlas.

Insertion. Along with the rectus major, into the occiput.

Use. To pull the head up quickly—the reverse of nodding.

Obliquus Capitis Superior.

A LITTLE higher up than, and to one side of, the rectus major.

Origin. From the superior border of the transverse process of the atlas.

Insertion. Into a ridge extended from the tubercle of the occiput.

Use. When both act, to assist in pulling up the head: singly contracting, they will turn it to one side.

These four pairs of small muscles are principally employed in *chucking up* the head—as when a horse is champing the bit, or annoyed by any irritation about the head.

Obliquus Capitis Inferior.

A SQUARE thick muscle, situated above the former, and much larger than it.

Origin. From the spine of the vertebra dentata.

Insertion. Into the superior parts of the transverse process and body of the atlas.

Use. What little rotatory motion the head is capable of, is effected chiefly by the single action of this pair of muscles. When both contract, the atlas, and the head with it, will be raised.

Spinalis Colli.

AN oblong rounded muscle, interspersed with tendon, closely applied along the roots of the ligamentum subflavum.

Origin. From the anterior oblique processes of all the cervical vertebræ, except the first and second, and

from that of the first dorsal, by tendinous and fleshy slips.

Insertion. Into the spines of all the cervical vertebræ but the atlas.

Use. To aid in the elevation of the head, and to act, both together, forcibly in the constrained flexion of the neck backwards.

ANTERIOR CERVICAL REGION.

THE muscles of this region are enveloped in a quantity of loose cellular membrane, which must be cleanly dissected off before they will appear distinct from one another.

Sterno-maxillaris.

THIS pair of muscles lies subcutaneously along the inferior and anterior parts of the neck. Near the sternum they are in close approximation, and are so intimately united, by fine cellular tissue, that much nicety in the use of the scalpel is required to detach them up to their place of origin. In proceeding upwards their union becomes weaker, and they gradually recede from each other, exposing, in the interspace, another pair of muscles, which I shall have occasion to describe after this. The sternal portion of this muscle is partially covered by a thin fleshy expansion---a portion of the levator humeri.

Origin. Fleshy and tendinous, from the cartilage projecting anteriorly from the sternum. Its belly is compact, rounded, and of inconsiderable breadth in comparison to its length. About three-fourths of its length upwards, it terminates in a flat tendon, which insinuates itself between the parotid and submaxillary glands.

Insertion. By a fan-like expansion of its tendon, into the angle of the posterior jaw.

Use. To inflex the head towards the chest. If one act by itself, it will incline the head and neck to one side. They will also assist the occipito-maxillaris in opening the mouth.

Sterno-thyro-hyoideus.

This is a trigastric muscle—having two fleshy bellies superiorly, and one interiorly, connected about the middle of the neck by a short slender tendon. The lower portion is round and long, and is completely buried between the sterno-maxillaris and trachea, the upper half, consisting of two bellies, is stronger, and is further strengthened by the junction of a broad layer of fleshy fibres, which originates from the levator humeri, passes obliquely across, and proceeds with this muscle to the head. These muscles may be said to clothe the anterior and upper parts of the air-tube.

Origin. Fleshy and tendinous, from the *anterior* cartilage of the sternum, above the place of attachment of the sterno-maxillaris. As they proceed upwards, alongside of the trachea, they have weak cellular adhesions to each other, and to those parts they run in contact with.

Insertion. The main part of this muscle, having crossed the front of the larynx, is inserted into the neck or spur of the body of the os hyoides. A separate slip, running between it and the trachea, and included within the larger portion, is fixed by a short slender tendon into the lower border of the thyroid cartilage.

Use. To draw the os hyoides, and larynx with it, downwards and backwards.

Scalenus.

A SHORT thick muscle, situated at the anterior and inferior part of the neck, below the cervical portion of the serratus magnus.

Origin. From the middle of the first rib.

Insertion. Into the bodies and transverse processes of the fifth and sixth cervical vertebræ.

Use. To straighten the neck, by drawing the upper part of it in a line with the lower. It is, in some respects, an antagonist to the splenius.

*** *Immediately above this muscle, is a slender fleshy slip, running from the upper part of the first rib into the belly of this: it might be denominated the* scalenus posticus.

Rectus Capitis Anticus Major.

A LONG thin muscle that borders upon those remaining to be described in this region, and extends from where the scalenus ceases to be inserted to the occiput.

Origin. By slender fleshy fasciculi, infolding two or three long slips of tendon, from the transverse processes of the second, third, fourth, fifth, and sixth cervical vertebræ. It first runs along the side of the neck, higher up it turns round under the transverse process of the atlas, and there in part becomes tendinous.

Insertion. Fleshy and tendinous, into the cuneiform process of the os occipitis.

Use. In co-operation with its fellow, to bend the head: by itself, it will also incline it to one side.

Rectus Capitis Anticus Minor.

STILL deeper than the rectus major, and just over it, runs this small, entirely fleshy muscle.

Origin. From the inferior part of the body of the atlas.

Insertion. With the foregoing.

Use. To assist the major.

Obliquus Capitis Anticus.

A DILICATE fleshy slip, placed a little more outwardly than the last-named muscle.

Origin. Close to the rectus minor from the body of the atlas.

Insertion. Into the point of the coronoid process of the os occipitis.

Use. To assist in flexing the head, and when one acts alone, to incline it aside.

The three last-described muscles are antagonists to the *recti et obliqui capitis postici*. In action, they concur to produce that nodding motion of the head so often seen in horses that are put on the bit; in which case, the neck itself remains almost fixed.

Longus Colli.

THIS pair of muscles invests the inferior parts of the bodies of all the cervical, excepting the atlas, and several of the anterior dorsal vertebræ. They are only in places separable from each other. They put on a convoluted appearance externally, as if several small muscles were blended together in their composition. Their fleshy fasciculi, short and compact, are here and there intersected by portions of tendon.

Origin. Inferiorly from the bodies of the six anterior dorsal vertebræ.

Insertion. Into the bodies and transverse processes of the six posterior cervical vertebræ, and, by a strong tendon, into the body of the atlas.

Use. The many and extensive attachments of this muscle, and the proximity of its points of action, render it one of considerable power and effect in the flexion of the neck: the rainbow curve, the constrained incurvation of the head towards the chest---as when a horse is stretching himself---are chiefly ascribable to its full and forcible contractions.

Muscles of the Head.

CRANIAL REGION.

THERE are but two that can be considered as cranial muscles.

Epicranius.

THE horse has two elevators of the upper eye-lid, and this muscle, one of them, might with propriety, in relation to its function, be called the levator palpebræ superioris *externus*. It is a palish, slender, subcutaneous muscle, obliquely placed upon that part of the frontal bone which gives rise to the orbital process.

Origin. Almost imperceptible, so delicate are its primitive fibres, from an aponeurotic expansion over the os frontis, above the orbital arch.

Insertion. Into the upper eye-lid, nearer to its inner than its outer angle; in the substance of which its fibres are blended with those of the orbicularis palpebrarum.

Use. To raise the upper lid, and more particularly the inward part of it.

Temporalis,

OCCUPIES the side of the skull, and is demonstrable

in the living horse. It is covered by a strong tendinous fascia, that has a firm adherence to those bones from which the muscle arises.

Origin. From the parietal, occipital, and squamose portion of the temporal bones, and from the fascia covering it. Its fibres, converging in their course, pass obliquely downwards, under the zygomatic arch.

Insertion. Into the coronoid process of the lower jaw.

Use. To shut the mouth. It is a powerful agent in manducation.

AURAL REGION.

In entering upon a description of these muscles, I may briefly remark, that the *concha* is the cartilage that gives shape and substance to the part of the ear which projects from the head; that the *scutiform* or *triangular cartilage* is a flat one, of three sides, loosely, and consequently moveably, attached to the temporal muscle; and that the *annular cartilage* is a small ring-shaped one that surrounds the root of the ear.

These muscles may be ranged in three divisions:—the *attollentes*, the *musculi propria conchæ*, and the *retrahentes*.

Attollentes Aurem,

Consist of four small muscles.

The Attollens Maximus is broad and thin, subcutaneously spread over the forehead, and extended from the vertex to the pit behind the orbit.

Origin. From the sagittal suture, along which it is united to its fellow by the intervention of a tendinous line, from the tubercle of the os occipitis, and from the fascia temporalis by cellular substance. Its fibres pass

directly outwards, and converge a little as they approach the ear.

Insertion. Into the entire upper border of the triangular cartilage.

Attollens Minimus. Thus may be denominated a fleshy slip which is detached from the middle of the maximus. It crosses the triangular cartilage, and terminates in an expanded form upon the inward part of the concha, about one-third of its length upwards.

Attollens Inferior. Subcutaneously situated, below the former, above and behind the orbit.

Origin. From the fascia temporalis, by cellular adhesion. It grows broader in its course to the root of the ear.

Insertion. Into the inferior part of the triangular cartilage.

Attollens Superior is brought into view by the reflection, from its origin, of the maximus, between which and the temporalis it lies hidden.

Origin. From the sagittal suture. Its belly, which is nearly triangular, having reached the ear, makes a turn to arrive at the posterior part of the concha.

Insertion. Into which it is inserted.

Use of the Attollentes. These muscles all co-operate in the erection or cocking of the ears. Acting in pairs, the maximi or minimi will approximate them; the superiores will elevate them; the inferiores, depress them. But, as the triangular cartilage is more particularly their seat of action, in order to produce these effects upon the concha, the aid of some smaller muscles, next to be described, is necessarily called for.

Musculi Proprii Conchæ,

Attach the triangular cartilage to the concha.

Anterior Conchæ *arises* from the outward surface of the triangular cartilage, where its fibres are incorporated with those of the attollens interior. It turns round in front of the root of the ear.

Insertion. Into the anterior part of the concha, just below its external opening.

Rectus Conchæ. A very small muscle, running from the outward part of the triangular cartilage, near its summit or apex, to the inward part of the concha.

Obliquus Conchæ *arises* close to the former, from the upper extremity of the triangular cartilage. It winds obliquely round to the fore part of the concha.

Insertion. Into the concha, where its trumpet opens.

Internus Conchæ. The strongest of the conchal muscles, lies concealed under the triangular cartilage.

Origin. From the inward surface of that cartilage. It makes a turn to the posterior part of the concha.

Insertion. Into the very root of the concha.

Use of the Muscuh Conchæ. The three first will assist in the erection of the ears, and present their trumpet-like apertures directly forwards, by drawing the conchæ round, and retaining them in close apposition with the triangular cartilages.

The internus will have directly the reverse operation —it will rotate the ear, so that its open part may look backwards, and collect sound from the rear: but it is to be remarked, that still it is not a retractor, for it will not depress the ears upon the poll.

Retrahentes Aurem.

These muscles are placed posteriorly.

Retrahens Superior *arises* from the ligamentum subflavum, near its implantation into the occiput.

Insertion. Running forwards and upwards, into the dorsum of the concha, about one-third of its length upwards.

Retrahens Inferior runs over the parotid gland.

Origin. Extensively from the gland, by very short and dense cellular membrane; so much so that their separation is a nice and tedious dissection. It tapers in its ascent to the ear.

Insertion. Into the outer margin of the concha.

Retrahens Medius, the largest of the retrahentes, is placed between the two others, and is bifurcate at its insertion.

Origin. From the occiput, ligamentum subflavum, and fascia of the neck.

Insertion Of the superior portion, into the outward part of the concha, near its root; of the inferior, into the root of the concha, and into the annular cartilage.

Use of the Retrahentes. They are all employed in the retraction of the ears, and have, at the same time, a tendency to rotate them, so as to turn their trumpets backwards. The superior has most effect in drawing the ear down upon the back of the neck; the inferior will slightly abduct it, and present its aperture outwards; the medius, in lopping the ear, will turn its hollow side completely round.

FACIAL REGION.

THE muscles in this region are many, and some of them complicated.

Zygomaticus.

A LONG slender superficial muscle, traversing the cheek.

Origin. By glistening tendinous fibres, from the lower edge of the zygomatic process of the os malæ.

Insertion. Into the angle of the mouth.

Use. To extend this angle, by drawing it upwards and backwards.

Levator Anguli Oris.

SUPERFICIALLY placed upon the fore part of the cheek.

Origin. By a thin delicate tendon, from the side of the os nasi.

Insertion. In its course, which is obliquely downwards and backwards, it splits into two portions: the inferior one grows smaller, and ends in the angle of the mouth; the superior disperses its fibres, from the angle, upon the upper lip and the side of the nostril.

Use. To retract the angle of the mouth, assist in the elevation of the upper lip, and dilate the nostril.

Retractor Labii Superioris.

Origin. By a thin cellular and tendinous expansion, from the os maxillare superius, near its junction with the os malæ. It grows broader in its descent, and passes between the divisions of the preceding muscle.

Insertion. Into the side of the upper lip, and lower part of the nostril.

Use. To retract those parts; and thus assist in raising the upper lip, and dilating the nostril.

Levator Labii Superioris.

A WELL-DEFINED muscle, of a pyramidal form, distinctly prominent upon the anterior part of the face.

Origin. Fleshy, from a little below the inferior border of the orbit. Its round compact belly runs obliquely forwards to the false nostrils, where a slender tendon is sent off that adheres to those parts by cellular membrane. Upon the extreme points of the ossa nasi it unites with its fellow; the two, then, form but one common tendon which dips into the middle of the upper lip.

Insertion. Here it expands and expends itself among the fibres of the orbicularis oris.

Use. To raise the upper lip, and dilate the false nostrils. If one only contract, the lip will be distorted, and the false nostril of that side only enlarged. Their action is well demonstrated in that peculiar corrugation of the upper lip so remarkable in stallions.

Dilatator Narium.

A SINGLE muscle of considerable thickness, seated between the nostrils.

Origin. From the tapering extremities of the ossa nasi, from which its fibres spread laterally.

Insertion. Into the alæ of the nostrils, and upper lip.

Use. To raise the alæ, and thus dilate the nostrils.

Retractor Anguli Oris.

Origin. ENVELOPED in loose cellular membrane, from the lower border of the under jaw. It runs downwards and forwards.

Insertion. Into the angle of the mouth, where its fibres are intermingled with those of other muscles.

Use. To draw the corner of the mouth upwards and backwards.

Retractor Labii Inferioris.

A LONG slender muscle, running along the side of the lower jaw.

Origin. From the *ramus* or branch of the posterior maxilla, united with the buccinator.

Insertion. By a small round tendon, into the under lip: having deeply penetrated its substance, it spreads out into numerous intraceable fibres.

Use. To raise the under lip. If one act, it will be elevated on one side only.

Buccinator.

THAT fleshy mass which fills up the space between the upper and under jaws, and immediately invests the membrane of the mouth. In order to obtain a full view of it, it is necessary to cut away a part of the masseter.

Origin. Tendinous, from that part of the under jaw between the last molar tooth and the root of the coronoid process; fleshy, from the tuberosity of the superior maxillary bone, and from the outward borders of the alveoli of the molar teeth. Its belly is composed of two orders of fibres: those of the outer run transversely; those of the inner, for the most part, longitudinally.

Insertion. Into the buccal membrane, wherever it is in contact with it, and into the angle of the mouth.

Use. To contract the cheeks, and retain the food, during manducation, between the grinding teeth.

Orbicularis Oris.

Between those loose reflections of integument composing the lips, is a mass of muscular fibres everywhere intimately adherent to them, which, from their circular course around these parts, may be described under this name. Those muscles that are inserted into the lips and corner of the mouth, may contribute to the production of this; but we may conclude, from their course being different, that the generality of its fibres are perfectly unconnected and distinct. It is stronger in the upper lip than in the lower; in both its fibres are mingled with an unusual proportion of cellular tissue, and embedded in adipose matter, including numerous mucous follicles, blood-vessels, and nerves.

Use. To close the lips. The prehensile power of the lips, so well seen when a horse is gathering up scattered grain from a plain surface, is owing to this muscle. In pressing the lips hard against each other, it will also have some effect in dilating the nostrils.

Depressor Labii Superioris.

By everting the upper lip, and carefully dissecting off its cuticular lining, we bring into view, on either side, a layer of pale fleshy fibres.

Origin. From the alveoli of the incisive teeth, and side of the inferior maxillary bone.

Insertion. Into the upper lip, and ala of the nose.

Use. To depress the lip and project it forwards, and to assist in dilating the nostrils.

Levator Labii Inferioris.

The situation of this muscle, in the under lip, is correspondent to that of the preceding one.

Origin. From the alveoli of the incisive teeth, and body of the lower jaw.

Insertion. Into the under lip.

Use. To raise the lip, and to project it forwards.

HYOIDEAL REGION *.

The subject having been turned, so that the head rests upon the *sinciput* or forehead, in order to dissect these muscles, the symphysis of the lower jaw ought to be sawn through, and its branches carefully forced asunder.

Digastricus.

This muscle has not two bellies, but two tendons. It is one of considerable length, and courses the side of the jaw.

Origin. By a long slender tendon, which pierces the fleshy belly of the stylo-maxillaris, from the styloid † process of the os occipitis. Leaving this muscle, in which it has been concealed, the tendon passes between the delicate tendons of the hyoideus, and then ends in a round fleshy belly.

Insertion. By another tendon, which comes off from the opposite extremity of its fleshy part, into the side of the jaw, inwardly, near to the symphysis.

Use. I am inclined to think that it is implicated in

* Prior to the dissection of these muscles, read the description of the os hyoides, given in Lecture xxxiii.

† As the muscles coming from this process correspond to those to which in human anatomy the technical indicative *stylo* is prefixed, it will be better, I think, to alter the name of the process than apply *new* ones to the muscles. This was not adverted to in the lecture on this bone, or it would not have been denominated the *coronoid* process.

action with the hyoideus. It can have but feeble effect in retracting or depressing the jaw.

Mylo-hyoideus.

This is a broad thin muscle of the penniform class, that spreads out between the branches of the jaw, and with its fellow forms a sort of bed for the tongue and muscles of the glossal region.

Origin. From the side and alveolar process of the jaw. Its superior fibres are stronger than those below.

Insertion. Into the body of the os hyoides. It is united to its fellow by a white tendinous line.

Use. To draw that bone forwards and upwards, and to raise the tongue in the mouth.

Along its middle it is connected to the

Genio-hyoideus,

Round and compact, lies immediately above the last, and is so intimately united with its fellow that the two appear to be but one muscle.

Origin. By a flat tendon, from the posterior jaw, near its symphysis.

Insertion. Tendinous and fleshy, into the spur-like process of the os hyoides.

Use. To assist the former in advancing and raising the os hyoides.

When the os hyoides is fixed, the two last-named muscles will assist in opening the mouth.

Hyoideus.

Exclusively attached to the os hyoides.

Origin. By a small round tendon, from the broad or

posterior part of the cornu. Its belly is partially split into two, from which proceed two separate tendons: these together form a sort of loop that includes one of the tendons of the digastricus.

Insertion. In two places, into the side of the body of the os hyoides.

Use. To pull this part of the bone nearer to the jaw, and thus contribute to the dilatation of the glottis.

GLOSSAL REGION.

THESE muscles, by their union with one another, compose that fleshy body called the tongue: their number and variety account for its extreme self-mobility.

Genio-hyo-glossus,

OF considerable breadth, spread out in the form of a fan, and placed immediately above the genio-hyoideus.

Origin. Tendinous and fleshy, from the inward part of the jaw, near the symphysis, in company with the genio-hyoideus. Its tendon reaches for some way along its inferior border.

Insertion. Some of its fleshy fibres run as far backwards as, and have an attachment to, the appendix and body of the os hyoides, but the bulk of them take their course obliquely upwards to be implanted into the whole length of the tongue.

Use. To project the tongue in the mouth, and draw it downwards: if one only act, it will be pulled to one side.

Hyo-glossus Longus,

FORMS the lateral part of the tongue.

Origin. By a thin weak tendon, from a little tubercle upon the cornu of the os hyoides

Insertion. Into the lateral and inferior parts of the tongue, vanishing in its tip.

Use. To draw the tongue within the mouth, and depress it.

Hyo-glossus Brevis.

Origin. From the lateral part of the body of the os hyoides. It grows broader during its course, and is entirely fleshy in substance.

Insertion. Into the base of the tongue, which it penetrates.

Use. To assist the former in the retraction of the tongue, and to depress the base of it.

Lingualis.

The interior of the tongue consists of a fleshy mass, the fibres of which run in various directions, and have, as their connecting medium, a considerable quantity of adipose membrane: this is generally regarded as a distinct pair of muscles, and called the *linguales*. They may be said to arise from the root of the tongue, and to terminate in its point. They receive the insertions of all the other muscles.

Use. To contract the tongue lengthwise, and to draw it within the mouth.

MAXILLARY REGION.

The next to be described are three short thick muscles, of great united power, which are inserted into the lower jaw.

Masseter.

A PAIR of strong well-defined muscles which outwardly constitute the *cheeks*: in well-formed, thoroughbred horses, they add much, by their prominence, to the beauty of the head.

The masseter is covered by a strong tendinous fascia from which its fleshy fibres are inseparable, many tendinous septa proceed from it, which intersect the fleshy substance, and split it into several distinct layers of fibres.

Origin. From the under part of the zygomatic arch, and from the superior maxillary bone. Its fibres pass obliquely downwards and backwards upon the side and branch of the jaw.

Insertion. Into the rough border around the angle of the jaw.

Use. To act, in conjunction with the temporalis, in the elevation of the jaw.

Stylo-maxillaris.

A ROUND, compact muscle, found above and behind the jaw, the fleshy fibres of which are strongly knitted together by tendinous interlacements.

Origin. From the styloid * process of the os occipitis.

Insertion. Broader than its origin, into the angle of the jaw.

Use. To pull the jaw backwards and depress it. It is an antagonist of the masseter and temporalis.

Pterygoideus.

THIS and the next muscle occupy the smooth exca-

* Olim *coronoid*

vated part of the branch of the jaw: they take the same course upon its inward part to what the masseter does outwardly.

Origin. At the base of the cranium, tendinous and fleshy, from the aliform or pterygoid process, and crus of the os sphenoides, and from the os palati.

Insertion. By spreading and divergent fleshy fibres, intersected by layers of tendon, extensively into the branch, side, and angle of the jaw.

Use. To close the jaws. If only one contract, the jaw will, in being shut, be drawn a little to one side. Their alternate action will produce that lateral motion of the jaw which is so effectual in comminuting the food.

PHARYNGEAL REGION,

Comprehends six pairs of small muscles belonging to the pharynx.

Hyo-Pharyngeus.

Origin. Very near the broad or posterior part of the cornu of the os hyoides.

Insertion. Into the side of the pharynx.

Use. To dilate this bag, for the reception of the food.

Palato-Pharyngeus.

Origin. From that part of the os palati which projects downwards into the cavity of the mouth.

Insertion. By an expanded termination, meeting that of the next muscle, into the side of the pharynx.

Use. Though acting in a contrary direction to the muscle above, it will assist in dilating the pharynx.

Stylo-pharyngeus.

Origin. By means of a thin membrano-tendinous substance, from the styloid process of the os temporis.

Insertion. Into the side of the pharynx.

Use. To pull it, in a direction, upwards and backwards, and thus assist in its dilatation *.

* The remaining muscles in this region—the *constrictores pharyngis*—will be given with the description of the pharynx.

LECTURE XXVIII.

I SHALL now return to the

Muscles of the Trunk.

PECTORAL REGION.

THE pectoral muscles constitute the breast, or, what is vulgarly and absurdly often called, the *bosom* of the animal.

Pectoralis Transversus *,

UPON the under and fore part of the breast, it takes its course transversely to the arm. In full-breasted horses, this pair of muscles form two remarkable prominences in front of the chest, extending backwards between the fore legs.

Origin. When first exposed, it appears to arise from its fellow of the other side, but further dissection will show a white tendinous line, by means of which it is taking its origin from the four first bones of the sternum. Its belly, which is broad, and thicker anteriorly than posteriorly, runs directly across to the inward part of the arm.

Insertion. Into the fascia of the arm, extending from the olecranon nearly half-way down to the knee.

Use. To confine the arm to the side in its motions

* *Primus, Anticus,* vel *Brevis.*

forwards and backwards, and to prevent that movement which, in common equestrian language, is called "all abroad." So far as the fore limbs do admit of abduction and adduction, which we have the best example of in that mode of going taught horses in riding-schools, termed *passage*, this muscle will act as a powerful adductor.

*Pectoralis Magnus**,

PLACED behind and above the former muscle, which must be removed in order to obtain a full view of it.

Origin. From the fourth, fifth, and sixth pieces of the sternum, from the cartilages connecting them, and from the ensiform cartilage, where, through the intervention of a white tendinous line, it is united with its fellow; also from the aponeurosis of the external oblique muscle, and from the cartilages of the false ribs, several of which are concealed by it. From these attachments, its fasciculi approach one another and unite into a long flattened belly, which runs forwards, inclining rather upwards, upon the true ribs.

Insertion. Into the lesser tubercle of the os humeri, and inward part of the lower end of the scapula.

Use. To pull the humerus, or more properly the point of the shoulder, backwards—drawing the scapula upright.

Pectoralis Parvus†,

A MUSCLE of less size than the preceding, along the anterior border of which it is taking a similar course.

Origin. Tendinous, from the inferior and projecting part of the sternum, where it is united with its fellow.

* *Secundus, posticus,* vel *longus* † Vel *Depressor scapulæ.*

from the anterior cartilage of the bone; and from its side. The belly of this muscle is round, and rather thicker than that of the magnus.

Insertion. Into the fascia covering the muscles upon the anterior part of the scapula and shoulder-joint, extending nearly as high up as the place of origin of the antea-spinatus.

Use. To assist the pectoralis magnus.

COSTAL REGION.

THESE muscles are all extensively attached to the ribs.

Serratus Magnus.

I MAY here remark, that, although the epithet *magnus* is mostly applied to this muscle, there is no serratus *parvus* vel *minor*. It is the connecting medium between the ribs and the blade bone, and is in a great measure hidden from view by the latter. In carrying our eye around the circumferent points of origin of the serratus, we shall find that it bears some approach in figure to a semicircle, of which its insertion is the centre.

Origin. Very extensive, from the bodies and transverse processes of the fourth, fifth, sixth, and seventh cervical vertebræ; and from the eight anterior true ribs, as low down as their cartilages, by as many fleshy digitations. The cervical portion is of considerable thickness; its fasciculi, and those coming from the chest, all converge towards a central point.

Insertion. By collected strong fasciculi, tendinous as well as fleshy, into the upper and inward part of the scapula—from the place of origin of the subscapularis to that of the insertion of the rhomboidei.

Use. This constitutes the main attachment of the scapula to the trunk—cut the serrati through, and the fore limbs can no longer sustain their burden.

I stated, in my lectures on osteology, that there existed no joints between the trunk and fore-extremities, so that half the trunk and the head and neck are actually in a state of suspension, and muscles, and above all the serrati, are the suspensary agents. From their functions being so laborious and important, then, we find that every advantage is afforded to enable them to act with power superior to that of most other muscles in the body. Their fleshy fasciculi are thick, red, and strong, their fibres have but little tendinous inter-texture, their attachments are broad and extensive; and their points of origin and insertion are contiguous to one another.

Moreover, the serrati are more or less concerned in all the motions of the scapulæ. From the great variety in the course of their fibres, they will move these bones forwards, or backwards, or downwards, so that we must regard them as powerful co-operators in the actions of the shoulder.

If the fore extremities be made fixed points, and especially if they be abducted a little, the serrati, by drawing the ribs towards the blade bones, become also powerful muscles of inspiration. This explains why horses, whose respiration is hurried or embarrassed, stand with their fore legs stretched apart, and why those labouring under pneumonia, seldom or never lie down. I apprehend, however, that they are not employed in ordinary, undisturbed breathing.

The scapula, in this stage of the dissection, should be detached from the trunk.

Superficialis Costarum,

Consists of a thin fascial expansion, terminating in, and interlaced with, a broad palish layer of fleshy fibres. This fascia invests the muscles contained in the dorsal region.

Origin. By tendinous fascia, from the ligamentum subflavum, in its extension through the back and loins.

Insertion. By fleshy and tendinous slips, into the most curved or prominent parts of the ribs, near their middles.

Use. To elevate the ribs, and thus dilate the thorax.

Transversalis Costarum.

Underneath the fleshy part of the superficialis lies this muscle. It takes its course transversely along the upper part of the chest, extending from the first rib to the last. It is remarkable for the number and regularity of its tendons, which pass off, after the penniform manner, from the inferior border of its belly, increasing in length, but growing narrower, as they approach the last rib.

Origin. By a strong tendon, from the transverse process of the last cervical vertebra.

Insertion. Into the superior parts of the ribs, at a distance from the spine, growing greater from the first to the last rib: its tendons are only fixed into their posterior edges.

Use. The vertebra being fixed points, and the two or three anterior ribs nearly so, it will pull the angles of the others forwards, and so assist in the dilatation of the thorax.

Intercostales Externi.

Regular courses of fleshy fibres, exteriorly striped with thin slips of tendon, which run from the posterior sharp edge of the rib before to the anterior rounded border of that behind. They are discontinued between the cartilages; the interstices there being occupied by the sterno-costales externi. Superiorly, at the angles, they are continuous with the levatores costarum.

Intercostales Interni.

Layers of fleshy fibres, interspersed with thin tendinous bands, covered by the externi, to which they are similar in their attachments, but contrary in course: they decussate each other, in fact, like the strokes of a cross—X.

Use. These muscles act from the anterior, upon the posterior ribs; which they pull forwards and have a tendency to throw outwards, and thus enlarge the cavity of the chest.

STERNAL REGION,

Comprehends two small muscles that are attached to the outward surface of the sternum.

Lateralis Sterni.

A small semi-tendinous band of muscle.

Origin. From the first rib, near its cartilage.

Insertion Into the cartilages of the three or four anterior ribs, and into the sternum.

Use. To raise the sternum, and contract the cartilages, and thus diminish the thoracic cavity.

Sterno-Costales Externi.

Several fleshy digitations, interspersed with slips of tendon, which are running from the cartilages of all the true ribs, excepting that of the first, to the sternum. Their fibres take the same course, and are continuous in the spaces between the cartilages, with the intercostales externi.

Use. Also employed in the contraction of the chest.

DORSAL REGION.

These muscles are connected with the vertebræ of the back.

Longissimus Dorsi.

Above the transversalis costarum runs this, one of the largest and longest muscles in the body. The posterior portion of it, which extends as far back as the ileum, is invested by a strong aponeurotic substance that gives origin to numbers of its largest fasciculi. In proceeding forwards upon the muscle, this fascial investment grows thin, cellular, and weak, detaching processes from the inward surface which enter and intermingle with its fleshy fibres: it vanishes, previous to the termination of the longissimus, among the muscles of the neck.

Origin. Tendinous and fleshy, from the crista of the ileum, from the spinous and transverse processes of all the lumbar vertebræ, and from the spinous processes of the six posterior dorsal.

Insertion. By coarse fleshy fasciculi, which take their course downwards as well as forwards, posteriorly into the angles of the twelve last ribs; by a

regular series of tendons, concealed in its fleshy part, into the transverse processes of all the dorsal vertebræ, and into those of the three or four hindermost cervical.

Use. This is a muscle of great power and extent of action. The motions of the spine, in the back and loins, are mainly produced by it. It will incline the fore quarters upon the hind, or the hind upon the fore, as these or those are made fixed points. It is a principal agent in kicking and rearing. If one act alone, the fore or hind parts will be carried to one side. The pair will also assist in the erection of the neck.

Spinalis Dorsi

Lies upon the anterior portion of the longissimus dorsi, of which some consider it a part.

Origin. It begins tapering upon the aponeurotic covering of that muscle, and may be said to arise, through the intervention of it, from the spinous processes of several of the posterior dorsal vertebræ. It rapidly increases in substance, grows thick, round, and partly tendinous in its course, and closely embraces the withers as it proceeds to the neck.

Insertion. Into the spines of the six or seven anterior dorsal vertebræ, and those of the three or four posterior cervical.

Use. To writhe the back, or bend the withers, and to assist the longissimus dorsi in erecting the neck.

Semi-spinalis Dorsi

Is composed of several packets of fleshy fibres, pretty regularly intersected by portions of tendon which are broadest and most remarkable at its anterior part.

Origin. From the transverse processes of the dorsal vertebræ. Its fibres run in a slanting direction forwards and upwards, and clothe the lateral and superior parts of these vertebræ, from the first to the last.

Insertion. Into the dorsal spines, receding from their tops as it proceeds forwards.

Use. To incline the spines backwards, and tend to pull one over the other. It co-operates with the longissimus dorsi.

Levatores Costarum.

Little prominent bundles of fleshy fibres, about fifteen in number, which take a similar course to the intercostales externi: indeed, they appear to be continuations of those muscles to the dorsal vertebræ.

Origin. By fleshy fibres, infolding small tendons, from the transverse processes of the dorsal vertebræ.

Insertion. By fleshy fibres, impacted in tendinous coverings, into the anterior edges of the ribs, in the spaces between their tubercles and angles.

Use. To assist the intercostales, and contribute a little to the elevation of the ribs.

LUMBAR REGION.

Of these muscles two are placed externally, and four internally—opposed to the abdominal viscera. *External.*

Semi-spinalis Lumborum

Is constituted of regular layers of fleshy fibres, similarly distributed in the loins to what those of the semi-spinalis dorsi are in the back, whence they are continued to the sacrum. They are covered by a thin ten-

dinous expansion, stretched from transverse to spinous process. In their attachments and use, they correspond to those of the back.

Intertransversales Lumborum.

SMALL muscles running from the sharp edge of one transverse process to that of the one next to it. They are included between two strong and tense intertransverse ligaments.

Use. To approximate these processes.

The subject should now be turned upon its back in order to dissect the muscles that are *internal*

Sacro-Lumbalis.[1]

THUS may be named a thin layer of disgregated fibres which traverses the under surface of the loins. Some are taking a straight line, others, a semi-circular course, others, again, decussate one another

Origin. From the most anterior and lateral part of the body of the sacrum, and from the transverse process of the last lumbar vertebra.

Insertion. Into the other transverse processes of the loins, and, of some few of its fibres, into the last rib.

Use. To co-operate with the intertransversales lumborum in approaching the transverse processes, and to fix the last rib.

Psoas Magnus

RUNS along the under part of the loins, above the kidney, covered by a strong tendinous aponeurosis. The psoæ constitute the inner part of a sirloin of beef, which at table is often preferred for its exceeding tenderness:

this may be accounted for by their fibres being finer than those of most other large muscles, and by their function being comparatively light.

Origin. From the inward surfaces of the two last ribs, close to their articulations with the vertebræ; and from the bodies and transverse processes of the last dorsal vertebra, and all the lumbar vertebræ. In its passage to the thigh, some of its fibres are blended with those of the iliacus.

*Insertion**. By a flat tendon, into the brochanter minor internus.

Use. To bend the femur upon the pelvis—to pull the haunch forwards in progression. When the hind quarters are fixed, it will produce that flexure of the spine which constitutes the *roach* back, vulgarly called "sticking up the back."

Psoas Parvus.

A SMALLER muscle than the last, placed between it and the spine.

Origin. From the heads of the sixteenth, seventeenth, and eighteenth ribs, from the bodies of the three posterior dorsal, and from those of all the lumbar vertebræ.

Insertion. By a thin flattened tendon, into a rough surface upon the os innominatum, below the acetabulum.

Use. To draw the pelvis forwards. When one acts, it may incline it to one side. The pelvis being fixed, this muscle will assist the psoas magnus in arching the spine.

* The search, with the knife, after the *insertion* of this muscle, and that of the two following, had better be deferred until the muscles of the hind extremity shall have been dissected.

Iliacus *,

A MUSCLE of considerable substance and power, placed above and in part exterior to the psoas magnus.

Origin. From that part of the crista of the ileum that has no bearing upon the sacrum; and from the anterior spinous process, venter, and inferior edge of the bone.

Insertion. It is continued down to the thigh in company with the psoas magnus, with which it is inserted.

Use. To advance the haunch.

INTERNAL COSTAL REGION.

THOUGH one of these muscles might with propriety have been included in the sternal region, and the other considered with equal justness as *within the cavity of the abdomen*, I have ventured to class them both together in this region for the convenience of dissection.

Diaphragm.

THE diaphragm is that fleshy and tendinous partition which divides the cavity of the chest from that of the abdomen. In the dead subject it is convex before and concave behind, which shape it assumes in consequence of the last effort of life being an act of expiration. Its convex part is covered by *pleura*, its concave by *peritoneum*. It may be divided into its body, and its appendices or crura: the first comprehends that portion which is the veritable muscular fence, the last, some fleshy slips that run from it along the spine within the cavity of the belly.

* Sometimes called Iliacus *Internus*, but the epithet is supererogatory

Origin. The body, sometimes called "the *greater* muscle of the diaphragm," arises by fleshy digitations from the cartilages of the eighth, and those of all the posterior ribs, with the exception of the two last; also from the cartilago ensiformis. From these points of attachment, they converge like the radii of a circle, and terminate, about midway between the ribs and the spine, in a thin expansion of tendon, which has received the name of the *cordiform tendon.*

The crura, or appendices of this muscle, are two in number, and lie by the sides of the aorta---which vessel takes its course between them: the right, much the longer of the two, arises, above that artery, from the inferior part of the bodies of all the lumbar vertebræ, the left or shorter has a tendinous origin from the under part of the body of the first lumbar vertebra, and by a separate tendinous slip from that of the second. They unite and decussate each other opposite to the seventeenth dorsal vertebra, form a fleshy belly, and this again splits into two portions previously to its insertion, in order to admit of the passage of the œsophagus.

Insertion. Into the upper part of the cordiform tendon. About the centre of this tendon is a perforation for the passage of the vena cava posterior; so that there are altogether three openings in the diaphragm:—an uppermost one between the crura for the aorta; another or lowermost, formed by the decussation of the crura, for the œsophagus; and a third in the centre of its tendon for the vena cava.

Use. The diaphragm is the principal, if not the sole, agent of ordinary inspiration: it acts in respiration in opposition to the abdominal muscles, which are the chief expiratory muscular powers. By the contraction of its

radiated fibres, aided by that of its crura, the cordiform tendon is reduced to a plane, and the dimensions of the chest thereby considerably augmented from before backwards; after which, its thoracic surface is rendered again convex, and its abdominal concave, by a general relaxation of its fibres, and the concomitant pressure of the viscera of the abdomen, in consequence of the reaction of the abdominal muscles. The diaphragm, however, may be made to act simultaneously with the abdominal muscles; as happens in the expulsion of fæcal matters, and of the fœtus.

Sterno-Costalis Internus.

This muscle lines the sternum inwardly; it is interposed between it and the cartilages of the ribs, and the pleura.

Origin. By tendinous roots, from the upper half of the sternum.

Insertion. Having become for the most part fleshy, and considerably thicker, into the cartilages of the true ribs.

Use. By pulling the ribs downwards and backwards to contract the cavity of the chest.

ANAL REGION,

Includes a pair of muscles, and a single one.

Retractor Ani.

A pair of small, fleshy muscles, which emerge from the outlet of the pelvis.

Origin. From the sacro-sciatic ligament, and from the ilium and ischium, where they unite to form the

acetabulum. Its fibres run upwards and backwards, and intermix with those of the sphincter ani.

Insertion. Into the side of the anus.

Use. To retract the anus—draw it within the pelvis.

Sphincter Ani.

The prominence of the anus consists chiefly of adipose matter; but, by carefully removing this, we shall find that it is partly composed of the muscle now under consideration.

Red bands of fleshy fibres surround the rectum as it terminates in the anus; indeed, they may be said to suspend it, for they are firmly attached above to the base of the coccyx, whence they proceed laterally upon the gut, and coalesce around its middle.

Use. To close the anus, after the expulsion of the fœces.

COCCYGEAL REGION.

Since an anatomical knowledge of these muscles is indispensable to the scientific performance of an operation that is often required of the veterinary practitioner—*nicking*—I shall dwell the more upon my description of them. In denuding them, it will be found that the skin is soft and thin upon the under part of the tail, where there is no hair, and that it grows thick and coarse as it approaches the tip: it is also more closely adherent to the muscle at that part, there being less cellular substance interposed. These muscles are divisible into four pairs, and most distinctly so near their origins: upon the coccyx their nearest fibres unite and blend with one another.

Erector Coccygis.

A PAIR of long pyramidal muscles, remarkable for their tendinous appearance externally, that form the upper and lateral parts of the dock.

Origin. It begins upon the croup, by attachments tendinous and fleshy to the transverse processes and spines of the sacrum, lying in a hollow between that bone and the posterior or bearing part of the ileum, and the ilio-sacral ligament. The muscle, when formed, is complex in its composition—consisting exteriorly of a flat tendon from which slips are detached in its course along the tail in a penniform manner over the belly of it, and of an interior or fleshy part which, diminishing in size and growing paler in its descent, closely adheres to the bone itself.

Insertion. Into the bodies and spines of the ossa coccygis. The insertion is chiefly fleshy, but here and there slips of tendon pierce its belly and take root in the bone. Its tendons, though they become very small about the extremity of the dock, there predominate so much over its fleshy fibres, that it is only by means of them that we can distinctly trace the muscle to its termination.

Use. To elevate the tail. If one only contract, it will also be carried to one side. Some horses can exert so much action with these muscles, that they can reflex the tail over the back, or curl it to either side, around the quarter.

Depressor Coccygis

TAKES its course along the under part of the tail, in a similar manner to what the preceding muscle does

upon the upper, of which it is the antagonist. Like it also it has externally a flat tendon; but this is much smaller, and does not detach any lateral slips until it has descended to near the middle of the coccyx. Its fleshy belly, on the whole, is more bulky; and consequently we may regard it as a muscle of more living power than the last; but it certainly possesses less mechanical strength in the dead subject.

Origin. Within the pelvis, from the sacro-sciatic ligament, and from the body of the sacrum. It grows smaller as it passes out of the pelvis, and forms a rounded prominence upon the under part of the coccyx.

Insertion. By strong and separate tendons, which issue from that traversing its middle, and are concealed in its fleshy belly, into the inferior parts of the bodies of the ossa coccygis. Its tendons increase in number, but diminish in size, as they descend *; and near the tip surpass in strength those of the erector. If a section is made of any part of this muscle, always two, and sometimes three or more of its tendons are severed: in nicking, the principal one generally projects within the section, and a portion of it is then excised.

Use. To depress the tail. If one alone is in action—in which case it may co-operate with one of the erectores—to incline it to one side: this is remarkable very often at the time that a mare is taking the horse. The power of these muscles can in no mode be better estimated than by attempting to raise the docks of horses that are "shy about the tail:" not infrequently does it demand the whole force of a strong arm to effect it, and

* So that the further from the anus the incisions are made in nicking, the fewer tendons are divided.

now and then the efforts of the animal cannot be overcome but by both hands.

Curvator Coccygis

Is a smaller muscle than either of them already described, between which it takes its course; but it bears a close similarity to them in the appearance and disposition of its fibres.

Origin. Within the pelvis, from the lateral parts of the sacrum, and commonly from the fourth and fifth lumbar vertebræ. Here it consists of two parts, which have been regarded as distinct muscles, the one accompanies the erector, the other the depressor coccygis.

Insertion. By tendinous and fleshy productions, intimately and inseparably interwoven, into the transverse processes of all the ossa coccygis.

Use. To incurvate the tail, or laterally flex it around the quarters. In switching off flies with the tail, these muscles, aided by others, are thrown into action to lash the hair forwards.

Compressor Coccygis.

A BROAD, flat muscle, which largely contributes to the formation of the root of the tail.

Origin. From the sacro-sciatic ligament, and from the ischium.

Insertion. Into the transverse processes of the four or five uppermost bones of the coccyx.

Use. To assist in depressing the tail and to maintain it forcibly pressed against the anus.

On Nicking.

NICKING is one of those operations which fanciful

art has had the presumption to invent for the improvement of nature. The arguments in favor of it are all grounded on what we regard as perfective of configuration; those against it may dispute that ground, and receive additional weight on the score of cruelty. It requires little or no argument to defend an act that carries with it corporeal sufferance, however severe, providing that act be undertaken to ward off or remedy an evil greater than the pain itself, as is the case in neurotomy, but it demands sober and deep reflection before we attempt to reply to all the animadversions that may be cast at us against the infliction of pain, acute and enduring, for the sake of improving the symmetry of an animal that may, by some, be regarded as already perfect. It is not with a view of decrying nicking that I make these observations; but it is to show them who are not of the profession, into whose hands these lectures may fall, that veterinary practitioners, however much it is their own interest, and their duty to their employers, to perform them, are not insensible to the sufferings they inflict by such operations, and consequently take all means, it is to be hoped, in their power to mitigate and abridge them.

Nicking consists in a surgical operation, the object of which is, to compel a horse to carry the tail erect. In order to obtain a physiological view of this operation, it will be necessary to revert to the actions of those muscles that raise and fall the tail. We must bear in mind that the depressors, in consequence of being in themselves larger than the erectors, and of having less tendon in their composition, are capable of overpowering their antagonists, and we must understand that these are voluntary muscles, and consequently that no other than artifi-

cial means, unless this balance of power be in favor of the erectors, can compel the animal to carry the tail erect. The application of mechanical means of any description could not fail to defeat, in part at least, the design for which they were used; for it is hardly conceivable that any thing, answering this purpose, could be contrived that would not be more or less unsightly: it naturally became a question therefore, and an important one with those who were admirers of the high tail, how the power of elevation might be made to predominate. What first gave rise to nicking—whether it was the result of accident—the groundless experiment of some unscientific equestrian—or the offspring of physiological reasoning—and how long it has been known and practised, I neither know, nor am about to inquire: it will be sufficient for us to understand the theory of the operation, and the principles on which it is, or ought to be, conducted.

If a complete section be made of a muscle, and the divided parts be allowed to approach each other, or be maintained in constant apposition, intimate union by adhesion will follow, and the muscle sustain little or no permanent injury from it, either in structure or in function; but if the disunited portions be kept apart from each other, so that adhesive matter fill up the vacuity, a loss of power will result, proportionate to the extent of this interposition. There are two reasons why an operation of this description should be productive of such effects. When the fibres of a muscle are first divided, they naturally shrink or contract from so sharp a stimulus as the knife; and, unless means be used to bring them together again, a gap is left, into which is effused, in consequence of the

inflammation excited by the injury, a quantity of adhesive matter, a substance, that, although it undergoes an entire change in the course of time, is never converted into muscular fibre: so that not only the fasciculi of the muscle shorten themselves under the knife, and in course are not susceptible of their wonted contraction afterwards, but the albuminous interposition obstructs that elongation which is a necessary preparative to a full and natural contraction. Thus, then, is the original structure of the muscle broken in upon, and thus is its action in consequence impaired, and the balance of power transferred to the erectors.

Though nicking is undertaken at all seasons of the year, they are unquestionably the most favorable during which neither frosts nor flies are likely to disturb the healing process. Prior to entering upon the operation, when we have the sole management of the subject, it is advisable to feed on bran mashes for a few days, and exhibit a little laxative medicine: the old practice of administering a dose of aloes on the day of operating is worthy of being followed when no preparatory regimen has been observed.

The operation itself, like most others that employ the veterinary surgeon, is simple in its nature and easily performed: I might, indeed, without much overstraining this point, regard it as purely a mechanical one; for there are but few horse-dealers or head-grooms who are not *au fait* at it, which is at least a practical demonstration that a little manual dexterity and experience will bear the operator out; for I do not imagine that these gentry will contend for any anatomical knowledge! The distinction lies here, as it does in all such cases, between the man of science and the man of no

science, in this—that the one is prepared to encounter any unusual appearance, or accident, that may present itself during the operation, and to combat any ill that may result from it; whereas the other is baffled, perplexed, and alarmed at such an event, and is as unfit to treat the morbid consequences thereof as the animal is to treat himself.

In all veterinary operations, it is of the first importance, both in regard to the skilful performance of the operation itself and the safety of the operator, to well secure the subjects of them; and in no instance ought both these considerations to induce us to pay more attention to this preparatory measure than in the present. It has been said of a surgeon, that "he should have a lion's heart, an eagle's eye, and a lady's hand;" but to the veterinary surgeon, in my opinion, the first of these qualifications is by far the most requisite, though his apprehensions in operating, it is to be observed, proceed from a different cause from those of the surgeon: the latter has a fellow-creature's life and a reputation at stake; the former, though humanity and reputation, I trust, always direct his knife, is in momentary bodily fear from the sudden, violent, and irresistible struggles of his patient. A timid, apprehensive, timid man is still more incapacitated for a veterinary surgeon than he is for a surgeon. Now, I believe it to be a very common practice *with the profession* to *cast* horses to nick them*; but if a horse-dealer operate no such precautionary measures are taken, and when the number of men required, the trouble, the time, the apparatus, nay the

* The *break* is now pretty generally out of use: it is a rude, awkward structure, emblematic of the times in which it was framed

danger, and above all the convenience of the operator, be taken into consideration. I feel surprised when I see it persisted in by any one, and more especially by one in private practice: from the necessarily awkward and inconvenient posture in which the horse lies when cast, it is impossible that the operation can be executed with that precision with which we can perform it in the standing posture.

I do not mean to affirm that a horse of a most untractable and vicious disposition may not compel us to resort to such a very objectionable* method of securing him; but every practitioner knows how very rarely this is the case!—my father, Senior Veterinary Surgeon of the Royal Artillery, who has now been in practice on a very extensive scale for twenty-eight years, tells me, that he has never had occasion to cast but *one* horse to nick him. The common, the simple, the effectual means of securing the animal, are the side-lines and the twitch. First, take care that the twitch be well put on the nose —so that a considerable portion of the upper lip be included in its twist, but not turned *tight* until the first incision be about to be made: then, buckle leathern hobbles, having rings attached to them, united by a single rope, around the hind legs, and carry the single rope over the off shoulder and withers, around the breast, back again through the ring, and, a second

* I do not consider this epithet too forcible, since many horses have been killed on the spot by casting. Vide Part I. Lect. xviii. the only reply to which, on the part of the caster, is, that the occurrence is *rare* and *unavoidable*! But is this a satisfactory or consolatory account to the owner, when the first groom or horse-dealer he meets shall tell him "that his horse might have been nicked standing!"

time, around the shoulder and breast; where it is to be held firmly by an assistant. In thus securing the hind legs, let them be brought as far forwards, under the belly, as is compatible with the animal's standing. Sometimes the operation is undertaken out of doors, and then, as a firm stay to the hind quarters, the horse is generally backed against a strong rail, or a leaping bar; but the chance of rupture in the hobble rope (which is not possible if it be of proper manufacture) is guarded against in the stable equally well by carrying another rope, with a noose, around both legs, between the hock and fetlock, and binding it, in the same manner as the first, around the shoulder and breast, or it may be run through a ring in the manger, and there held by the assistant. Having thus secured the animal, and the twitch being sharply twisted *, the operator may fearlessly stand directly behind him, in order to include the hair, at the extremity of the dock, in a ligature of waxed twine, fast and many times bound around it †. Then, having raised the tail into the erect position with his left hand, with a double-edged scalpel, or with a strong lancet ‡, held with its point elevated in the right, let him make, at about three inches from the anus, two

* To some, this precaution may appear here punctilious and supererogatory. I feel persuaded that no old practitioner will commence the operation before he has ascertained this point, and I am desirous to impress the necessity of it on the mind of the young one.

† When the hair is weak and scanty, some tow or suitable material should be carried *under* the dock and intermingled with it, and the whole platted together: this will serve to suspend the tail by, and probably save, particularly in strong docks, the subsequent eradication of hair, from the use of heavy weights.

‡ The generality of "nicking knives" are the bawbles or ridiculous inventions of instrument makers. The best instrument for

lateral incisions through the bare integuments, commencing from the sides of the os coccygis and extending them to the roots of the hair; afterwards, let him unite these cuts by an intermediate incision, which he is to make with a light hand, and to be particularly cautious does not penetrate beyond the skin: otherwise he will be in danger of wounding the inferior ligament and of laying open the joint. Next, by repeated strokes outwards with the knife, he is to deepen the lateral incisions until he has completely divided the fleshy and tendinous bellies of the depressores coccygis. Unless the subject is a mare *, or that degree of erection only which is known by the "blood tail" is the *disideratum*, a second nick is to be made, in a similar manner to the first, while the tail is yet elevated, about three inches posterior to it; having completed which, the operator may let down the tail, and lay aside the knife. Some make it a practice to divide the muscles a third time, in which case the second incision should be made nearer to the first: I believe that it is seldom required—certainly not in a short dock. Seldom much or any blood escapes while the tail is held upwards— the blood-vessels, in that constrained position of it, being compressed, but as soon as it is relaxed, several small streams issue from the wounds. The next step of the operation is to elevate the tail as before and examine the incisions: the fleshy parts divided will be found to be retracted and shortened; but the tendons, incapable of retraction, will be seen protruding from the nicks, and more so

this operation is a double-edged scalpel, the lower half of the blade of which is filed or roughened.

* Mares, in my humble opinion, ought never to be nicked; the reason is obvious; and blood horses are but rarely so without detracting from the elegant slope and beauty of their quarters.

from the larger than from the smaller ones. These tendinous productions should be excised, if they are allowed to remain they are disposed to slough and protract the healing process: for this purpose, give the tail to an assistant and direct him to hold it *perpendicularly* *; then seize them with a tenaculum, or pair of dressing forceps, and snip them off with a pair of probe pointed scissars. The tail being kept elevated, now insinuate a pledget of fine tow, with twisted tails, into the uppermost nick, and, as soon as the dock has been gradually lowered, tie these tails in a fast knot around the hair: two pledgets are mostly required for the large wound; one is sufficient for that below †.

In binding the wounds up with tow, or lint, or other soft material, after the operation, we have no other object in view than the suppression of haemorrhage; when we imagine therefore that this is fulfilled, without a risk of relapse, we snip the twisted ends of the bandages upon the dock in two, and allow them of themselves to drop off: the time commonly prescribed for this proceeding is twenty-four hours; the only objection to half of that space of time is, that the pledgets would fall off during the night, as the operation is, and very properly, **mostly performed in the morning.**

The divided muscles, no longer separated by the intervention of a foreign body, would now unite again, and with that union recover their lost function, with but little or no impairment, were the tail permitted to hang down, relaxed, in its natural dependant posture;

* In bending it over the back there is danger of rupturing the inferior ligament, and bursting open a joint: this is called "breaking the tail."

† No dressing whatever should be applied. Digestives and other farragos are all uncalled for, indeed most of them do harm.

but, the object of the operator being to deprive the depressors of their overpowerful action, measures are now to be taken to retain them apart until the intervals become filled by organized adhesive matter. It has been, and may now be for aught I know, the practice to allow the tail to remain dependant, without suspension: the event of this experiment is, that the tail is carried in the drooping or blood-like fashion; but, I believe, that even this carriage is not permanent, in consequence of the muscles, in the course of time, regaining their wonted tone and power. Now and then, under such circumstances, unless the parts be kept clean and free from irritation of any kind, the cuts will degenerate into foul and troublesome ulcers; and these may require, when freed from dirt and other irritants, some stimulant or detergent dressing: I should conceive that it would be generally advisable also to suspend the tail in these cases, unless it were in a state of active inflammation.

Various apparatus have been contrived to answer this end. It used to be the practice in Ireland, and I believe is now in some parts, to bend the dock over the back, and affix it by straps, &c. to the circingle or belly-girth; and, in this plight, to turn the animal to grass, without further solicitude about him: this method will account for the peculiar flexure backwards of the tail in many of the Irish horses; in some of which I believe that the dock has had its ligaments sprained or lacerated, and its joints in consequence contorted. What are whimsically called "nicking *machines*" have had a few recommenders; but not one of these contrivances has been admitted into general use, nor can I aver that I have ever seen one that merited it. From the fixture of these inventions upon the back, the tail is of neces-

sity drawn at once into a perpendicular, or, what is infinitely worse, trained backwards and upwards. both are overstrained positions, and consist of harsh and painful treatment during the early stages of this proceeding; and the latter is further and unanswerably objectionable from the tendency that it has to produce that frightful incurvation of the point of the tail over the back, denominated, in sportsmen's language, the "squirrel tail." Independantly of all this however, the difficulty, and even impossibility, of maintaining the "*machine*" in its place are sufficient reasons for decrying it.

In order to keep the dock elevated then, for it is in that position that the cut extremities of the muscles recede from each other, we have recourse to an apparatus consisting of lines and pulleys, which, though from some little apparent complication and nicety requisite in its adjustment, I am ready to admit, is not free from objection, is, on the whole, the most suitable to this end, and the least painful to the animal, of any that has yet come under my observation. There are two lines, which are commonly of lee cord, and two double pulleys required: the one, the cross line, is extended across the posterior part of the stall, about two feet and a half above the croup of the horse; the other, that by which the tail is suspended, runs through one pulley that plays from side to side upon the cross line, and another which is fixed, at some distance from it, directly behind the stall *: to this line is appended a weight †. The chief mystery in pulleying consists in making use of a weight

* Some stables are so constructed that this cannot be contrived, and the tail is consequently pulleyed to one side now and then it is carried afterwards awry from this.

† This short and imperfect description will suffice to denote the

that will not carry the tail much above the level of the back for the three or four days posterior to the operation, and of adding to that weight afterwards according as the state of the tail may admit, or its elevation require; for four and twenty hours after, the irritability of the part is much heightened by the consequent inflammation, during the continuance of which it is that all the mischief is done by violent suspension: to abate this, it is an old and a good practice, to keep the dock wet with cold water.

About the fourth or fifth day, when the swelling and heat have subsided, the weight may be augmented, so that the dock be extended at an angle of about 45° from the body; and now the horse may be taken out of the pulleys and walked out daily for about half-an-hour. Whenever the tail is liberated from the pulleys, which it should not be at any other time than that of exercise, the waxed ligature around its extremity ought to be removed, and the hair combed smoothly out and wetted: this precaution, as well as the sprinkling of the tail with water while in suspension, will prevent the loss of hair which is so apt to result from the neglect of it *. During the second week, the weight of suspension may be, at twice, still further augmented, so that the tail, about the expiration of that time, be elevated nearly in a perpendicular line from the croup; to accomplish this, however, it will be also necessary to carry the cross

sort of apparatus here recommended. a knowledge of the method of applying it can only by obtained by actual inspection.

* When docking and nicking are required in the same individual, I would recommend that the nicking process be ended before docking be undertaken, otherwise, a considerable loss of hair may be experienced.

line forwards, so that the suspending line run directly upwards from the tail, when fully erect. This being the maximum of elevation, it only remains that we watch the healing process, and every two or three days have the animal ridden and trotted before us, in order that we may see what progress has been made in the carriage of the tail; for this, as I have so lately demonstrated, mainly depends upon the force and application of the means of suspension, and not upon the mere section of the depressor muscles. If it appear that these muscles, in the course of a week after the operation, still retain too much power, we must lose no time in advancing the cross line, and appending to it additional weight, for, unless we exert our mechanical influence upon them at this period, all subsequent impressions will prove unavailing. In estimating the proper degree of elevation of the tail, our opinion should be regulated by the general contour of the horse, but particularly by the conformation of his quarters: the lank, lengthful, muscular haunches of the racer would lose that elegant declination and pliancy, in our eye, for which they are so much admired, were the tail a cocked one; no less would the high, prominent, and well-turned quarter of the charger be degraded by a drooping tail—what ennobles a hunter with a tail "set on" rectilineally with a straight back more in appearance than the erection of it, or what so ridiculously and cruelly disfigures the round, fat, squab rump of a cart horse as a short tail sticking out at right angles from its centre! We need not be under much apprehension, unless a blood tail be desired, that the erection, so long as no reflex of the dock is observable, will be in excess, indeed, if the high or lofty car-

riage of it be the object, we cannot promote its elevation too much; for it is a fact well known, that the tail invariably sinks a little in the course of a few weeks after its final liberation from the pulleys: the organized interpositions contract, the divided portions of muscle become less distant from each other, and consequently their power grows somewhat greater; and this is the reason why the tail ought to be kept in suspension for a week, or two even, after the nicks are quite filled up. Should the tail at any period be carried awry, which may happen from some inequality of the lateral sections of the muscles, or from the suspending line hanging to one side, it ought to be trained as much as possible to the opposite side: a little attention to this will not fail to right it again.

Before I conclude this subject, I shall make a few remarks on the ill consequences that may result from nicking. These are but few, and but rarely met with: so disposed is every injured part to heal and do well in horses, that daily, nay hourly, is this operation (and indeed all others almost) performed by unskilful hands, and the subjects of it treated with perfect unconcern and indifference; and yet how rarely do we hear of any untoward results! Of whatever nature, they are almost always attributable to overweighting the suspending line early after the operation, and to fixing the cross line too forward, over the animal's back, or even his shoulder, and thereby violently restraining the tail; so that even here they cannot be ascribed to any indisposition in the parts themselves to take on healthy action.

Tetanus has followed nicking. So far as relates to the local treatment of the tail, it is advisable, if one be

called in early, to amputate it above the uppermost incision.

We hear of mortification of the tail after this operation. Mechanical violence, most unquestionably, may induce such a state of parts; but if the tail be removed from the pulleys, the cause of the mischief, before the gangrenous stage has commenced, I much doubt its supervention afterwards. The tail (and in some cases the croup) first grows exceedingly tender to the touch, swells, and feels hot underneath; but, if it be taken out of the pulleys at this time, and proper antiphlogistic means actively made use of, the inflammation will subside, and all yet do well. Should the local disease run high, abscesses may form in the nicks, burrow among the muscles, and engender a symptomatic fever in the system that threatens life itself: I have seen a case of this description, where everything was judiciously managed from the very commencement of the operation, which terminated in death from constitutional irritation. The primary object here is, to relieve the tail from constriction; the secondary, to counteract the ill effects of it upon the constitution: fomentations, simple or anodyne—poultices—simple dressings—venesection—purgatives—nauseants, &c.—and a low diet—are the remedies we must call to our aid.

LECTURE XXIX.

Muscles of the Fore Extremity.

I SHALL make two general divisions of the muscles of this extremity, and distribute them, in each division, into their respective regions.

Muscles of the Shoulder.

None of these muscles pass below the elbow; the greater number of them are attached to the scapula and os humeri, and are confined in their action to the shoulder-joint.

EXTERNAL SCAPULAR REGION

Comprehends three muscles, running upon the dorsum scapulæ, to which they are tightly bound down by tendinous fasciæ.

Antea Spinatus.

Origin. The antea vel supra spinatus fills up the fossa antea spinata, from which it arises, as well as from the spine and anterior costa of the scapula.

Insertion. Into the summits of the greater and lesser tubercles of the os humeri, and into the capsular liga-

ment of the shoulder-joint. At the point of the shoulder it sends off a tendinous expansion over the joint, between which and the tendon of the biceps we find a bursa mucosa.

Use. To extend the os humeri on the scapula; at least, as far as that motion is admitted of.

Postea Spinatus.

The postea vel infra spinatus is larger than the former muscle.

Origin. From the fossa postea spinata, and from the spine of the bone.

Insertion. By a flat tendon, into the outward part of the greater tubercle of the os humeri; by fleshy fibres, into a ridge extending from it, and into the capsular ligament. Between its tendon and the tubercle is a bursa mucosa.

Use. To assist in the flexion of the humerus, and, seemingly, to roll it a little outwards.

Teres Minor.

A thin triangular muscle, adhering to the posterior border of the postea spinatus.

Origin. By an expansion of tendon, from the posterior costa of the scapula.

Insertion. Into a ridge continued from the greater tubercle of the os humeri, just below the implantation of the tendon of the former muscle, by a thin flat tendon.

Use. The same as that of the postea spinatus.

INTERNAL SCAPULAR REGION.

The two following muscles lie upon the inward part of the scapula.

Subscapularis.

A MUSCLE of a triangular figure, filling up the hollow of the scapula.

Origin. From the anterior and posterior costæ, and from the venter scapulæ.

Insertion. By a flat tendon, into the lesser tubercle of the os humeri---adhering in its course to the capsular ligament of the shoulder-joint: between them is a bursa mucosa.

Use. To assist in the extension of the shoulder-joint, and to turn the humerus inwards.

Teres Major

TAKES its course along the posterior edge of the subscapularis, to which it adheres.

Origin. From the posterior angle of the scapula.

Insertion. By a flat tendon, into the inner and upper part of the body of the os humeri, along with the tendon of the latissimus dorsi.

Use. To assist in bending the shoulder-joint, and to roll the humerus a little inwards.

POSTERIOR HUMERAL REGION.

BEHIND the humerus is a considerable fleshy mass, which, although it consists of three distinctly separate portions, I shall analogically treat of but as one muscle. It far surpasses in bulk any single muscle of the fore extremity; and it bears a close resemblance in disposition and action to the triceps extensor cubiti of the human subject.

Triceps Extensor Brachii.

A THICK and powerful muscle, consisting of three fleshy portions, called its *heads*.

Origin. The *caput magnum vel primum* arises, tendinous and fleshy, from the posterior costa of the scapula, from which its fibres run, in a convergent manner, to the point of the olecranon.

The *caput medium vel secundum* takes its origin from the outward sides of the neck and body of the os humeri, and soon unites itself with the former.

The *caput parvum vel tertium*, which may be called the *humeralis internus*, arises from the inward part of the os humeri, near its middle, and runs obliquely downwards and backwards, to unite itself with the others, prior to their insertion.

Insertion. By a strong but short tendon, into the olecranon of the ulna, which it completely surrounds: some of its fleshy fibres are continued down upon the fascia of the arm.

Use. To extend the arm *.

* Every now and then tumors make their appearance at the point of the elbow. Those I have seen were meysted, loose and moveable under the skin, solid and firm throughout, of the consistence of cartilage, and not unlike it—being of a callous or warty nature, in appearance; they bled readily when cut into, but did not seem to give any pain to the animal on compression. These cases require the following operation. Make an incision down to the tumor, and extend the cut from one lateral limit of it across to the opposite. Having done this, the tumor may be slipped from its bed entire; so that it only remains to cut away the cellular adhesions around its base. Scarcely any blood will flow but from one, and that the supplying artery; which may be tied or cauterised. The skin should afterwards be brought over the mouth of the opening, and the case treated as a common wound.

Mr Feron has met with dropsical swellings at the point of the elbow, which, he says, "frequently take place from bad management in the shoeing of the fore feet, by leaving the heels of the fore shoes too long, by which means the point of the shoes come in contact with the point of the elbow every time the horse lies

Anconeus.

A SMALL muscle, between the back part of the elbow-joint and the triceps: the latter must be carefully dissected from its point of insertion in order to expose it.

Origin. From the inferior and posterior part of the os humeri. It passes down between the condyles of that bone.

Insertion. Into the olecranon, and capsular ligament of the elbow-joint.

Use. To assist the triceps, and to brace the capsular ligament.

ANTERIOR HUMERAL REGION

COMPREHENDS those muscles which are seen in front of the humerus.

Coraco Humeralis.

Origin. By a slender tendon, from the coracoid process of the scapula. It becomes fleshy and broad upon the inward side of the os humeri, in descending upon the head of which it has a bursa between it and the tendon of the subscapularis.

down."—"I have met with some of these watery enlargements in the elbow of a grey horse of the 12th Light Dragoons, that contained two quarts of water, and after having him tapped, and the water evacuated, in three days the swelling was as big as ever."—"This operation was repeated four times, and nearly the same quantity was evacuated at each time, making the whole quantity of water taken from the *elbow-joint*, nearly eight quarts, English measure." I cannot make up my mind to agree with this writer on the nature of the swelling: I believe it to have been purely *bursal*—and not to have had any communication whatever with the elbow-joint. See FERON'S *Treatise on Farriery.*

Insertion. Into the inner and fore part of the body of the os humeri.

Use. To assist in extending the shoulder-joint, and, perhaps, in turning the humerus inwards.

Flexor Brachii.

This muscle answers, in regard to situation and use, to the biceps flexor cubiti of the human subject, it is not however a biceps muscle in the horse. It is placed in front of the shoulder-joint; where its origin is concealed by the insertion of the antea spinatus.

Origin. By a strong round tendon, from the coracoid process of the scapula. This tendon runs within a groove between the tubercles of the os humeri, and the under part of it, which much resembles cartilage, is cupped in order to fit it to a bony prominence, covered by cartilage, in the middle of this groove: thus a pulley-like adaptation, having all the advantages of a joint, is formed here between the tendon and the bone; for their surfaces are lubricated by synovia, and this is contained within a membranous sac, in order to facilitate their motion*. A few, pale, fleshy fibres are seen running upon the upper surface of the tendon at this part. Below the head of the os humeri, the tendon swells into a round, compact, fleshy belly, which, upon its under part, has still many tendinous intersections.

Insertion. Tendinous, into the inward parts of the head and neck of the radius; where it adheres also to

* The joint-like cavity formed by the tendon of this muscle, has no connection whatever with that of the shoulder-joint, so that any puncture made into the former cannot, with propriety, be called an open *shoulder*-joint

the capsular ligament of the elbow-joint: from it a tendinous expansion is sent off to the fascia of the arm.

Use. To bend the arm, by carrying it forwards and upwards: it is, in fact, an antagonist of the extensor brachii.

Humeralis Externus.

Origin. From the posterior and inner part of the neck and body of the os humeri. It turns obliquely round that bone.

Insertion. Into the inner and upper part of the body of the radius, a little below the flexor brachii.

Use. To bend the arm.

On Lameness of the Shoulder.

The disease vulgarly called *founder*, *body founder*, or *chest founder*, was supposed by our old writers on farriery to have its seat in the chest or shoulder; I need scarcely add, however, that the name, as well as the doctrine, have been justly exploded from our present pathology. "Lameness in the shoulder" is the phrase now in common use to denote the expression of pain, or impediment in action, in the parts composing the shoulder: a symptom or effect of disease of which I shall now attempt to discover the seat and nature.

Horses so affected have a peculiar halt in going, from which alone, in the generality of cases, we are called on to decide that they *are* lame in the shoulder. To such as are familiar with this gait (and every one may soon be with a little attention) it is almost unnecessary to say, what may be found in most writers on

this subject, that it consists in an inability to project the affected limb with the usual freedom, or, as it is commonly said of the animal, that "he cannot get his leg forward." When urged to trot—for even these horses rarely *walk* lame—he evidently experiences pain every time he advances the lame limb, for scarcely has he bent the arm, than he instantly extends it again, and accompanies the action with a lower inclination of the head, and a more sudden *abaisement* of the sound side than when he is lame in other parts. And in advancing the lame leg, he makes a sweep with it, so that if the toe dragged, he would describe a segment of a circle outwards upon the ground, and this, with the occasional "hitting of the toe," and the low and sudden declination of the head and opposite fore quarter, are our surest diagnostics. There is no swelling, no perceptible heat, seldom any tenderness of the part: the wasting of the shoulder that is described as a symptom by some, is never present until the disease has existed for a considerable time; and when it is, it is solely referable to the limb being favoured, and the consequent loss of muscular substance, ever attendant upon a state of inactivity. I am not speaking now of lameness that results from external injury of any description, but exclusively of that which is the offspring of internal violence.

Having decided that the lameness proceeds from the shoulder, every reflecting mind will naturally inquire, where the precise seat is, and what the proximate cause is, of the disease present. Some assert, that the *muscles* are the parts affected, and more especially the *serratus magnus*; the fibres of which, say they, are either

sprained or lacerated. Others, with no less plausibility, contend that the proximate cause is to be sought for in the shoulder-joint *. Without venturing to pronounce both these opinions theoretical—though, I must confess, from the few opportunities which offer for *post mortem* examinations of these parts in a state of disease, I shrewdly suspect that they are -I do not consider either of them worthy of implicit reliance in practice; because I can name another part, which, in my opinion, is equally liable to be injured, and will, if diseased, better account for the character of the lameness. I allude to the joint-like connection, I have so lately given a description of, existing between the tendon of the flexor brachii and the upper and fore part of the os humeri. This is a part more likely to be sprained, or have its cellular and membranous connections lacerated, than any other, I think; and it is certainly one that has much to do in the projection of the arm, which action is here so defective: at the same time, I am ready to acknowledge, that hitherto my dissections have not cleared up the point satisfactorily. There is one other fact however that seems to corroborate this opinion, which is, that, in nine cases out of ten, a blister applied simply to the *point* of the shoulder will remove the lameness in the course of two or three weeks. If it were a sprain or laceration of the serratus magnus, a blister so remote from it, one would think, would hardly so frequently give relief; and if it consisted in a sprain or laceration of the ligaments of the shoulder-joint, would not

* Gibson calls these accidents "sprains in the shoulder;" but he has not told us what parts are sprained. In one place, however, he says, "sometimes the lameness is in the joint, but *very rarely*." Gibson's *New Treatise on the Diseases of Horses.*

it require a longer interval of rest? I am now speaking *generally*. what may happen in particular cases, I cannot provide against.

The common causes of this disease are sudden and violent muscular efforts of the fore limbs—such as, alighting upon them from a high leap, instantaneous springs or bounds in action, treading unexpectedly with one foot in a rabbit hole, making a false step, galloping upon heavy or uneven ground, suddenly turning, &c. granting that the tendon of the biceps is the seat of sprain or laceration, it appears to me that the mischief is done in some sudden and forcible contraction of that muscle.

With regard to the treatment, I have already intimated that we are to apply our remedies to the point of the shoulder; and of all others, a blister over its surface is the best. Mild stimulants do not answer so well, rowels and setons are not active enough for these cases; and cold washes and fomentations are next to useless. A liquid blister should be rubbed in, and repeated every three or four days, or from that to a week, according to its effect. Many veterinarians make it a practice to take blood from the *plate* vein; and, if it be a recent case, the practice is very commendable: but I would not take more than from four to six pounds. I think that a dose of physic is in all cases of service. But, above all other considerations is the quietude of the limb—let it be kept in a state of rest if possible. this is best attempted by putting a patten shoe upon the foot of the diseased limb, by keeping the horse racked up, and by spreading long litter around him.

It occasionally happens, but frequently when the case has been neglected or mismanaged at first, that, after

this treatment has been persevered in for a reasonable length of time, the lameness, although considerably abated, is not entirely removed. This circumstance appears to be ascribable to the protracted state of inactivity in which the limb has been kept, so that a somewhat contrary mode of practice becomes necessary, in order to restore the parts to their wonted condition and tone; such as turning the horse loose into the stable, and removing the patten shoe, after a time, from the lame to the sound leg.

Muscles of the Arm.

THE muscles of the arm are firmly bound down by tendinous fascia, from which the fibres of some of them are taking their origin: they consist of flexors and extensors.

SUPERFICIAL POSTERIOR BRACHIAL REGION.

THE muscles in this, and the following region, form the back part of the arm, arise, almost all of them, from the internal condyle of the os humeri, and constitute the flexors of the leg and foot. They lie immediately under the fascia.

Flexor Metacarpi Externus

Is situated on the *outer* side of the other superficial flexors.

Origin. Tendinous, from the outer and back part of the external condyle; and from the capsular ligament of the elbow-joint. Its cylindrical belly, which is in part made up of tendon, is continued towards the knee, a little above which it sends off a flat tendon that soon splits into two portions.

Insertion. One is fixed to the os trapezium, the other passes on through a tendinous sheath to be inserted into the head of the outer small metacarpal bone.

Use. To bend the leg.

Flexor Metacarpi Medius

Lies along the *middle* and back part of the arm.

Origin. Tendinous, from the internal condyle of the os humeri. Its fleshy belly is somewhat smaller, but longer, than that of the flexor externus.

Insertion. Into the os trapezium.

Use. To bend the leg.

Flexor Metacarpi Internus

Takes its course along the *inner* and back part of the arm.

Origin. Tendinous, from the internal condyle of the os humeri—adhering to the capsular ligament of the elbow-joint. Its belly is smaller and more approaches the cylindrical form than that of the last-named muscle. Its tendon, which is considerably smaller and longer, passes through a theca at the back of the knee, by which it is firmly retained in its place.

Insertion. Into the head of the internal small metacarpal bone.

Use. To bend the leg.

Flexor Accessorius Sublimis,

Sometimes called the flexor metacarpi *parvus*; but I prefer this appellation, as the muscle is in truth only accessory to another of the flexors. Its slender belly runs between those of the flexores metacarpi, externus et medius.

Origin. Fleshy, from the posterior and inward part of the ulna. About midway between the elbow and knee, it gives off a slender tendon.

Insertion. Into the tendon of the flexor perforans.

Use. To assist the flexor perforans.

DEEP POSTERIOR BRACHIAL REGION.

THE following muscles constitute the deep-seated flexors: they lie anterior to, and are concealed by, the superficial.

Flexor Pedis Perforatus.

Origin. BY short tendinous fibres, in common with the muscle next to be described, from the lower part of the internal condyle.

Its fleshy belly is at first blended with the head of the flexor perforans. At the back of the knee it is confined by a ligament, which is fixed to the inward part of the radius; still lower it is inclosed by a broad transverse ligament, to which I shall give the name of the *ligamentum annulare posterius*. Along the leg its tendon is inclosed within a cellular sheath, common to it and to the tendon of the perforans. At the fetlock-joint it passes through a large theca, which is lined and circumscribed by a membranous bag, and contains synovia: this much facilitates the motions of the tendon, and prevents friction between it and that of the flexor perforans. The tendon at this part is broader, and much flatter, so as to embrace the one before it; still lower, it forms of itself a complete sheath for the tendo perforans.

Insertion. At the small pastern-joint it splits into two parts, which are fixed into the upper and back part of the os coronæ.

Use. To bend the large and small pastern-joints, and, in consequence of its ligamentous brace at the knee, to assist in flexing the leg *.

Flexor Pedis Perforans.

So blended is this with the former muscle, that the two, were a knowledge of them less important to us, might be treated of as a biceps muscle.

Origin. The same as that of the flexor perforatus †; before which it takes its course. Its belly, which is somewhat longer than that of the perforatus, may be divided into three or four fleshy slips, interlaced with tendon. At the knee, it passes under the posterior annular ligament, where it partakes of the nature of cartilage, and is enclosed, together with the tendo perforatus, in a complete synovial bag, in which it is confined by cellular connections. Below the knee, these tendons assume different forms, this being cylindrical, that of the perforatus flat; which admits their contiguous surfaces to be broadly applied to each other. In their passage down the leg, they are both invested in cellular sheaths, and these sheaths are blended together, and connected with the suspensary ligament and cannon bones. At the fetlock the tendo perforans itself grows flat; but lower down it recovers its original shape, and runs within the sheath formed by the tendo perforatus, from which it only emerges at the division of the latter.

Insertion. Being opposite to the os corona destitute of any tendinous covering, it is enveloped in cellular mem-

* The knee cannot be completely bent unless the elbow is also in a state of flexion, in order to relax the extensors of the leg and foot

† The tendinous origins of the flexor perforans, and flexor perforatus, are connected with the capsular ligament

brane, and is continued over the os naviculare—having a bursa between them—to be implanted, by an expanded termination, into the posterior concavity of the os pedis.

Use. To bend the foot. It will also assist in the flexion of the pasterns and leg.

Flexor Accessorius Profundus.

By some considered as a part of the flexor perforans.

Origin. From the middle and back part of the radius; where it is concealed by the flexor perforatus. It gives off a tendon that joins the tendo perforans; which it will assist in action.

ANTERIOR BRACHIAL REGION.

These muscles form the prominent part of the arm in front, take their origin from the external condyle, and operate in the extension of the leg and foot. They have much less power than the flexors, collectively considered.

Extensor Metacarpi Magnus.

A muscle cylindrical and remarkably compact, found upon the fore part of the arm.

Origin. Fleshy, from the external condyle of the os humeri, and from the body of the bone a little above it: its fibres also adhere to the capsular ligament. Below its middle, it becomes tendinous. Its tendon passes under the anterior annular ligament of the knee, within a synovial sheath; where we find a bursa mucosa.

Insertion. In an expanded form, into the anterior and upper part of the os metacarpi magnum.

Use. To extend the leg.

Extensor Pedis.

Origin. From the front of the external condyle of the os humeri; and from the upper and outer part of the head of the radius. It becomes tendinous near the same place where the extensor metacarpi does, than which however it is smaller. It takes its course under the annular ligament at the knee, and there plays within a bursa mucosa, and has a cellular attachment. In passing over to the front of the cannon it is tied down by cellular membrane, and in front of the fetlock and pastern, it adheres to, and strengthens, the capsular ligaments of those joints.

Insertion. By an expansion of its tendon, into the lower end of the os suffraginis, into the os coronæ, and into the coronal process of the os pedis.

Use. To extend the foot and pasterns, and, from being embraced by the annular ligament at the knee, to assist in the extension of the cannon.

Extensor Suffraginis.*

Origin. A muscular slip, that arises from the upper and outer part of the radius, and from the ulna. It transmits a slender tendon, which passes down by the side of the ulna, and runs over the inner and fore part of the knee, within a sheath of its own.

Insertion. With the ligamentum extensorium, between which and the tendon of the extensor longus it runs in its course over the cannon, into the upper end of the os suffraginis.

* I prefer this name, as being more appropriate, and less likely to create confusion, to that of extensor metacarpi *longus*, having already *magnus* and *parvus*.

Use. To assist in extending the knee and fetlock; and probably to keep the ligament tense.

Extensor Metacarpi Obliquus, vel Parvus.

Origin. FROM the outward part of the body of the radius. Its belly consists of a small fleshy slip, from which is given off a slender tendon. This crosses under the tendon of the extensor pedis, but over that of the extensor metacarpi, to the inward part of the knee, where it runs through a tendinous theca.

Insertion. Into the upper part of the os metacarpi internum.

Use. To keep the tendon of the extensor metacarpi in its place; and to assist in straightening the leg.

Before I pass to the hind extremity, I wish to say a few words about some muscular appendices of the cannon. By the French writers they are described as so many muscles: BOURGELAT has named them the

Lumbrici,

AND from their size and shape, they may be very well likened to earthworms. So little about them appears to be known to the profession in this country, that a *surgeon* has within the present year published an account of them with this superscription:—"Two *new* muscles discovered."

They consist of two pairs of palish weak muscles, with long slender tendons.

One pair—we may call the *lumbrici posteriores*—are to be found, invested in adipose membrane, adhering to the sides and inward parts of the tendo perforans, about one-third of its length upwards from the fetlock.

Hereabouts they are broad; but they grow narrow as they descend, assuming the pyramidal figure, and give off at the fetlock slender flattened tendons, which seem to unite and form the crescentic border of a cellular and tendinous sheath to the tendo perforatus.

The *lumbrici anteriores* lie within the spaces left between the small metacarpal bones and the suspensary ligament, covered by the flexor tendons. They are much longer but much thinner than the former, and come into the class of half penniform muscles. They adhere for some way down to the ossa metacarpi parva, become solely tendinous about the middle of the cannon, wind round the tuberculous ends of the bones they arise from, and vanish in the adipose substance in front connected with the extensor tendons.

I cannot assign any determinate use to these small muscles. They are alike in the fore and hind extremities.

LECTURE XXX.

Muscles of the Hind Extremity.

THE superficial muscles of the hind extremity are not found immediately underneath the skin; there intervenes an aponeurotic covering to them, called the *fascia lata*. Although this fascia invests every part of the haunch, it is not of the same uniform texture throughout: it is dense, strong, and tendinous in its composition, upon the fore, outer, and back parts; but it is thin, weak, and cellular upon the inside of the limb. Its chief attachments are to the ileum, the pubes, the ossa coccygis, and the stifle: it is continuous superiorly with the aponeurosis of the external oblique, and with the fascia lumborum. Below it extends upon the muscles of the leg—giving them a complete covering—and vanishes in an expansion over the hock. In many places, it insinuates itself between the muscles and takes root in the bone; in others, the muscles themselves in part arise from it.

Its use appears to be, to bind down the muscles, prevent displacement of them during action, and thus contribute to their power and effect.

The muscles of this extremity naturally divide them-

selves into those of the haunch, and those of the thigh*; I shall therefore draw a line between the regions of the one, and those of the other.

Muscles of the Haunch.

ANTERIOR FEMORAL REGION.

THESE muscles, four in number, constitute the fore part of the haunch: they are all inserted into the stifle.

Tensor Vaginæ.

A THIN flat muscle that lies underneath the fascia lata, upon the fore and outer part of the haunch.

Origin. Tendinous and fleshy, from the anterior spinous process of the ileum, and by some fleshy fibres from the fascia lata. About midway between the pelvis and stifle it sends off a thin expansion of tendon by which it is inserted.

Insertion. Into the tendons of those muscles that are fixed to the patella, into the ligaments of that bone, and into the bone itself. It is also connected to the trochanter minor externus, and continued into the fascia lata.

Use. To assist in drawing the haunch forwards and upwards, and, perhaps, in extending the thigh its primary action, however, is to tighten the fascia lata.

Rectus

Is a thick cylindrical muscle, prominent upon the anterior part of the haunch, covered partly by the tendon of the tensor vaginæ.

* It must be remembered, that what is called the *thigh* of the horse, is the part between the stifle and the hock

Origin. In part concealed by the iliacus, by two broad and flat portions of tendon, from the dorsum of the ileum, a little anteriorly to and above the acetabulum. These tendinous roots, which are rendered indistinct by adeps, soon unite and form a round, compact, fleshy belly, which near its termination is interlaced with glistening tendinous fibres. It ends in a short but exceeding strong tendon, which, before its insertion, is inseparably united with the terminations of the two following muscles.

Insertion. Into the upper and anterior parts of the patella.

Vastus Externus

Runs along the outward side of the rectus.

Origin. Tendinous and fleshy, from the root of the trochanter major—investing the inferior part of that process, from the trochanter minor externus, and from the whole outward surface of the body of the os femoris. Its belly is flatter and larger than that of the rectus, with the tendon of which it is in intimate union.

Insertion. With the rectus, into the upper and outer part of the patella.

Vastus Internus.

Origin. From the inward part of the neck of the os femoris, just below the attachment of the capsular ligament; from the root of the trochanter minor internus; and from the whole inward part of the body of the bone. From these origins, the fibres run obliquely forwards and downwards, forming a thick mass of muscle, similar in appearance, though not

equal in size, to the vastus externus: near its termination, it unites itself to the rectus.

Insertion. With the rectus, into the upper and inner parts of the patella.

Use. In consequence of the connection of these muscles---the rectus and the two vasti---to the tibia, through the intervention of the patella and its ligaments, they become powerful extensors of the thigh, and this power is considerably augmented by the mechanism of the stifle-joint, upon which they are acting with the combined advantages of the pulley and the lever. They will, in progression, draw the thigh forwards, and extend it under the trunk, and, when the leg and thigh are fixed, they will advance the haunch.

INTERNAL FEMORAL REGION

Comprehends the muscles composing the fleshy mass upon the inward part of the haunch.

Sartorius

Is a long thin muscle, crossing obliquely over the inward side of the haunch, immediately under the fascia lata.

Origin. Fleshy, from the brim of the pelvis, about midway between the symphysis pubis and the anterior spinous process of the ileum. In its course, it passes over part of the psoas magnus and obliquely crosses the vastus internus; at the inward part of the stifle it terminates in a thin delicate tendon, which unites itself to the more expanded one of the gracilis.

Insertion. Into the inner and upper part of the tibia.

Use. To assist in bending the leg; and, when bent, to rotate the head of the tibia inwards *.

Gracilis †

Is a broad, thin, semi-tendinous muscle, superficially placed upon the inside of the haunch.

Origin. Tendinous and fleshy, from the symphysis pubis, as low down as the ischium, where it is united to its fellow of the opposite side. Its broad, fleshy belly, striped with tendinous fibres, forms that remarkable prominence upon the inside of the thigh in the living animal.

Insertion. Approaching the stifle, it terminates in a broad tendon, which is connected with that of the sartorius: they are inserted together into the inner and upper part of the tibia.

Use. To flex the tibia, and rotate it inwards ‡.

Pectineus.

A SHORT cylindrical muscle, that runs upon the inside of the thigh: its posterior border is connected with the gracilis.

Origin. From the upper margin of the pubes, near the symphysis.

Insertion. Tendinous and fleshy, into a ridge of bone extending from the root of the trochanter internus.

Use. To flex the haunch, and at the same time adduct it.

* The tibia has a degree of rotatory motion when flexed upon the os femoris.

† Sometimes called adductor tibialis.

‡ When the stifle is rotated inwards, the hock is necessarily turned outwards.

Triceps Femoris.

A LARGE fleshy mass occupying the inner and back part of the thigh, so much of which is concealed by the gracilis that it becomes necessary to remove that muscle in order to obtain a full view of it. Its posterior edge is bounded by the biceps, its anterior by the pectineus and sartorius. It has, as its name implies, three heads, which are commonly described as so many separate muscles, under the names of *adductor brevis*, *adductor longus*, and *adductor magnus:* I shall first notice the

CAPUT BREVE, which is the uppermost or most anterior portion.

Origin. From the upper part of the pubes, near to the sympyhsis.

Insertion. Taking the course of the pectineus, it is inserted into the body of the os femoris, behind that muscle.

CAPUT LONGUM is situated behind the former, than which it is much longer.

Origin. From the pubes, in the space between the foramen magnum and symphysis, behind the origin of the caput breve. It takes its course along the posterior border of that head.

Insertion. Into the middle and back part of the os femoris—continuing to be attached for some way down. A slip of this muscle is sent down to be inserted with the third head.

CAPUT MAGNUM is larger and longer than either of the other heads, and more posteriorly situated.

Origin. As far back as the os coccygis, from the sacro-sciatic ligaments, and from the tuberosity of the ischium. Its course lies between the biceps and caput longum.

Insertion. Into the inner and upper part of the tibia, behind the tendinous expansions of the gracilis and sartorius.

Use. The principal action of all the heads of this muscle is to extend the os femoris upon the pelvis, by drawing it backwards: so that they are opponents to the psoas magnus and iliacus. They will also act as adductors—approach the stifles. The caput magnum will assist the flexors of the tibia, and rotate it a little inwards *.

GLUTEAL REGION

Includes the three gluteal muscles, and they compose the upper part of the quarter.

Gluteus Externus†.

A fleshy slip placed behind, and united to, the gluteus maximus.

Origin. From the third spinous process of the sacrum, and from the fascia lumborum. It runs along the posterior border of the gluteus maximus, between it and the long head of the biceps, over the trochanter major.

Insertion. Into the trochanter minor externus.

Gluteus Maximus.

A muscle of considerable size, lying superficially upon the outer part of the haunch, and giving that prominence and rotundity to its exterior, so admirable in a full-quartered horse. Its fibres are very coarse when compared with those of other muscles; they are generally also of a darker red hue.

* Those muscles which rotate the *tibia* inwards, when they have done so, will act as adductors.

† This muscle corresponds, as far as regards its relative situation, to the gluteus maximus of the human subject

Origin. From the spinous and transverse processes of the two or three last lumbar vertebræ, from those of the two or three upper sacral, and from the fascia lumborum; from the crista of the ileum, and from its dorsum and posterior spinous process; and from the sacro-sciatic ligaments. From these origins its fasciculi run in a convergent manner towards the *trochanter major.*

Insertion. Into the sides of that process by tendinous and fleshy fibres. Between the tendon and the point of the trochanter is a bursa mucosa.

Gluteus Internus.*

The gluteus maximus must be reflected in order to expose this muscle; which is best done by detaching the former from its point of insertion.

Origin. From the dorsum of the ileum, as high up as the part where the gluteus maximus ceases to be attached, and as far back as the edge to which the sacro-sciatic ligament is affixed. It is much smaller than the afore-described.

Insertion. Into the anterior and less projecting part of the trochanter major.

Use. The glutei, of which the maximus is by far the most powerful, are extensors of the os femoris on the pelvis, or of the pelvis and loins on the os femoris. When the limb has been carried forwards under the body by the muscles of the anterior femoral region, and the toe firmly set down, the glutei will extend the haunch, and move the trunk onward. Both in rearing and kicking they are in violent action: in the former, the limbs are the fixed points, in the latter, the trunk.

* Vel parvus.

PELVIC REGION.

THESE muscles, mostly small ones, run from the pelvis to the upper end of the os femoris.

Pyriformis.

Origin. Within the cavity of the pelvis, from the transverse processes of the sacrum. It passes out through the great sacro-sciatic notch, and terminates in a small round tendon.

Insertion. Into a cavity behind the trochanter major.

Use. To assist in the extension of the haunch.

Obturator Externus.*

Origin. Without the pelvis, from the rim of the foramen magnum, and from the external surface of the obturator ligament. Its fibres run directly outward.

Insertion. With the former muscle.

Use. It will assist in the extension of the haunch, and rotate it a little outwards.

Obturator Internus.

Origin. Within the pelvis, from the surrounding rim of the foramen magnum, over which it expands, and from the obturator ligament. Its fibres converge, and pass over the brim of the pelvis, between the tuberosity and spine of the ischium, and then make their appearance upon the outside of the pelvis, near the hip-joint.

Insertion. Into the root of the trochanter major.

* *The foramen magnum* is partly filled by a thin ligamentous expansion, called the obturator ligament, which is generally enveloped in adeps. Muscular fibres are taking their origin from this ligament, both within and without the pelvis.

Use. To draw that process nearer to the pelvis, and thereby roll the haunch outwards.

Gemini.

Some small fleshy slips, corresponding in situation to the muscles so called in the human subject.

Origin. From the ischium, between its spine and tuberosity.

Insertion. Into the root of the trochanter major.

Use. To turn the haunch outwards.

POSTERIOR FEMORAL REGION.

These muscles are found upon the outer and back part of the haunch.

Biceps Femoris *.

That large fleshy mass, forming the outermost part of the quarter posteriorly, is made up entirely of this muscle, which, from its superficial situation, has its course exceedingly well marked in the quarters of the thorough-bred horse.

Origin. From the lateral and posterior parts of the sacrum, and from several of the ossa coccygis; from the great sacro-sciatic ligaments; from the tuberosity of the ischium; and from the fascia lata. From these different origins a thick fleshy belly is produced, which fills up the space between the trochanter major and tuberosity of the ischium, and grows flatter as well as smaller in its course down the limb: about midway between its origin and insertion, it divides into two distinct portions, which have separate terminations.

* Biceps cruris of Stubbs.

Insertion. Into the outer border of the patella, and into its external ligament. The second or lower portion is inserted, through the intervention of an aponeurotic expansion, into a ridge upon the upper part of the tibia, and into the fascia of the leg, which it adds much to the strength of.

Use. The heads of the biceps, from having different insertions, will perform different uses. The anterior, or upper one, will assist the rectus and vasti in extending the thigh; but the posterior will aid in its flexion: they will both have some effect in abducting the limb, and in rotating it inwards—the hock at the time turning outwards.

Semitendinosus *

Is placed behind the former muscle, and, with the semimembranosus, constitutes the posterior boundary of the haunch.

Origin. From the spinous processes of the two or three upper bones of the coccyx, and from the fascia lata. Soon after its origin it becomes inseparably united to the semimembranosus, with which it is inserted.

Insertion. By a thin expanded tendon, into a ridge upon the upper and fore part of the tibia inwardly, directly opposite to the insertion of the lower head of the biceps femoris.

Use. It is a flexor of the leg; it will also turn the point of the stifle inwards, and consequently the hock outwards, in which action it becomes an opponent to the biceps.

* This and the following muscle are sometimes described together by the name of abductor tibialis.

Semimembranosus.

Origin. With a part of the biceps, from the tuberosity of the ischium; a little below which it becomes blended with the semitendinosus.

Insertion. By a tendinous expansion, common to it and the semitendinosus, into the upper and fore part of the tibia inwardly.

Use. To assist the semitendinosus.

Muscles of the Thigh.

As the fleshy parts of these muscles are all included between the stifle and hock, they may be considered under this general head: there is no fleshy fibre below the hock, and consequently there are no muscles, anatomically speaking, proper to the leg. The first I shall give a description of, may be said to lie in the

SUPERFICIAL POSTERIOR CRURAL REGION.

They are all fixed to the os calcis, all extensors of the hock; and one of them, at the same time, is a flexor of the fetlock and pastern.

Gastrocnemius Externus.*

A muscle of considerable power that runs superficially along the posterior part of the thigh.

Origin. By two heads, the outer one from a rough hollow just above the external condyle of the os femoris, the inner from the internal condyle, and from a ridge extending from it. Opposite to the back part of the stifle

* Vel magnus, vel brevis.

they unite and form one fleshy belly, glistening in many places with tendinous fibres: midway between the hock and stifle this ends in a flat tendon, easily divisible into two, which decussates the tendon of the next muscle.

Insertion. Into the point of the os calcis.

Use. To extend the hock.

Gastrocnemius Internus *.

Situated before the former muscle, which should be detached from its points of origin to lay this bare.

Origin. From an excavation in the os femoris, a little above its external condyle, by a round tendon. Its belly is of less magnitude than that of the gastrocnemius externus, but it has more tendon in its composition. It becomes wholly tendinous about half way down the thigh, and its tendon, which is flat, twists round the flat one of the externus before it reaches the hock; so that the relative position of these muscles is reversed in their tendons†. In passing over the hock it expands, and is implanted around the summit of the os calcis; thence it is continued down the posterior part of the leg, and here takes the name of tendo perforatus. I shall postpone the further description of it until the tendo perforans come under our notice.

Use. To aid in the extension of the hock, and to flex the fetlock and pastern.

Plantaris.

The most slender muscle, in proportion to its length, in the body, creeping in concealment along the outer and back part of the thigh.

* Vel parvus, vel longus.

† These parts by butchers are called the "ham strings."

Origin. In common with the flexor perforans, from the head of the fibula. Its slender belly gives off a delicate round tendon, which unites just above the hock with the tendon of the gastrocnemius externus, with which it is inserted.

Use. To feebly assist the gastrocnemii in extending the hock.

The tendon of the gastrocnemius internus having crossed that of the externus, expands and forms a theca for it, which is attached to its sides by cellular membrane. The part that envelopes the tendinous top of the os calcis, is hollowed out inwardly, in such a manner that a complete ball-and-socket joint is here constituted, whose cavity is circumscribed, within the space of about one inch above, and the same distance below the point of the hock, by being lined by a thin pellucid membrane, the surface of which is lubricated by a synovial fluid, and altogether puts on the appearance of, and is in fact, a bursa mucosa, but it is one of unusually large size, and one which, from its liability to disease, is of more consequence to us than most others of the same description.

On Capped Hocks.

A CAPPED hock (according to some writers, after the French, a *capelet* *) may be said to be, an enlargement of the capsule of the hock. The tumor has a puffy, elastic feel, and is loose and moveable under the fingers; but the animal evinces no tenderness when it is compressed, nor is there any heat perceptible in it: at least, these are the ordinary external signs. The

* So immediately from *capel*, the old French word for a covering for the head—cap, hat, now *chapeau*

common size and indeed shape of these swellings is that of the larger cone of a hen's egg; but they vary much in respect of the former *. Writers on this disease regard it as a "dropsical swelling" of the part; and so it most unquestionably is in many, but not in all cases. The tumor contains either a serous or a glareous fluid, varying in quantity with the size of it, which, when let out by tapping, is generally tinged with blood from the external wound. But I have punctured the capsule, when it has presented all the external character of dropsical accumulation, without, to my surprise, the escape of any fluid whatever; and I have found, on examination, that the enlargement was owing to a thickening of the tendinous cap itself. Without doubt, in very many cases the integument will also be swollen; but this speedily subsides, and does not, of itself, properly constitute a *capped* hock. It is but seldom that we see horses lame from these swellings; and when they are, it is only temporary; unless there be something extraordinary about the case. It may here be asked, why we give ourselves so much concern about them, seeing that they are not commonly productive of inconvenience? We do so mostly because they are regarded as blemishes; and certainly they are not so without reason: nothing, to my eye, more disfigures a horse than a capped hock; that mark of degradation, a "broken knee," is not, in my opinion, more unsightly than this.

This disease may be the product of a sprained hock; but I believe that it will be found to be, with few exceptions, the result of mechanical injury. In aggravated

* Mr Farrow relates the case of one "that grew as big as a *sixpenny* loaf." *Treatise on Farriery.*

cases, it is common to see the points of the hocks excoriated or bare, and we find, on inquiry, that these horses have been kicking in harness. Sometimes we meet with horses who are the subjects of it from a vicious habit of kicking in their stalls, or from lying down upon pavement without litter: in such cases, before any remedial means are adopted, it is necessary that measures be taken to prevent the recurrence of the cause.

The treatment of these swellings, if they be recent, is extremely simple. Nothing more is required than an evaporating or refrigerent, or what is better than either, a discutient lotion *, aided, perhaps, by a dose of purgative medicine, or an occasional diuretic. Very many of these cases indeed need no treatment whatever –they will subside of themselves; while others are thought so lightly of by their owners that we are not called on to do anything. If the case is not a recent one, and there is to the feel a great deal of thickening and induration of the capsule, nothing is so likely to be of avail in its removal as frequent blisters. I would rub about an ounce or an ounce and a half of the *infusum lyttæ* upon the swelling once or twice a week, according to the effect produced, (taking care to wash off the scurfy inspissated discharge every time the blister was renewed,) and I would turn the horse loose into a box, and give him walking exercise too, or, if the weather permitted, turn him out altogether.

With regard to puncturing capped hocks, or passing setons through them, they are both condemnable operations. Though I have succeeded to the utmost of my

* The formula will be found in Part I. Lecture v. p. 83. Let about two spoonsful be rubbed in twice a day. Walking exercise is generally serviceable.

wishes in inveterate cases by these experiments. I have had one case in which so much consequent inflammation first seized the hock, and then the whole limb, that the attendant irritative fever, had not active antiphlogistics been promptly had refuge to, would to all appearances have carried off the patient*. Passing a seton simply under the skin, so as to establish a cutaneous issue, is too dribbling a counter-irritant to rely upon.

DEEP POSTERIOR CRURAL REGION.

The following muscles lie deep-seated, close to the tibia, between it and the gastrocnemii. They are confined down by a tense and strong tendinous fascia.

Popliteus.

Placed at the back part of the stifle-joint, it approaches the triangular figure.

* Mr. Feron details an interesting case, the result of which led him to the same conclusions. A horse of the 13th Dragoons produced by kicking a considerable dropsical swelling of the point of the hock, "that grew as big as a sixpenny loaf in less than a month," and, treated by "powerful astringents and blisters," continued to grow "larger rather than smaller." Having resolved to treat it like a hydrocele in the human subject, he says, "I therefore took a trocar, and let water out to the quantity of three pints, and in the place of it I injected two glasses of port wine, mixed with the same quantity of water, made blood-warm."—"Very desperate inflammation and fever" supervened, which, by copious venesection, purgatives, fomentations, and poultices, was subdued; "and in the course of five weeks, from the beginning of the operation, the horse was discharged perfectly cured." Mr Feron concludes thus—"Although this operation has been attended with success, yet the inflammation is so rapid, and the danger so great, that it cannot be recommended as a safe remedy, for," &c. *Treatise on Farriery.* Vide "*Capelet*"

quence of inflammation, and I would say, in common language, that it was a solid, firm, ill-defined swelling at the back of the hock, about three inches below its point *. On its first appearance, heat may generally be perceived in it, and the animal flinches from pressure; but, in the course of a few weeks, inflammation subsiding, the heat leaves it, and it grows hard and insensible to the feel. Generally speaking, to an eye unaccustomed to view these parts in health, a curb is by no means likely to strike the attention; and, indeed, now and then, the prominence is so gradual that even an experienced man may overlook it, unless lameness direct his attention thither: the common and best manner of detecting the disease, is to take a side view of the hock, nicely trace with the eye the perpendicular of the leg, and accurately note any irregularity of surface; the feel of it will assist us to form our diagnostic, and the absence of any such unevenness of surface upon the opposite leg, will confirm it. If it has made its appearance on a sudden—and it frequently does so from galloping upon heavy ground, leaping, &c. it consists, in the first instance, of an extravasation of blood into the theca of the tendon, in consequence of the rupture of some small vessels upon its interior, which, when shed, is confined to this spot by the surrounding cellular connections. But, if no rupture of blood-vessels has happened, though the part have received that degree of violence which must be followed by inflammation, a curb will not make its appearance until effusion has taken place into the sheath: this at once explains why

* This is the common site of the tumor, but I have seen a curb at the space of six inches from the summit of the hock

horses "throw out curbs" after having stood at rest for several hours; while others shew them immediately after work. In curbs of long duration the structure of these parts undergoes a change, and most of all the lining membrane of the theca: this becomes, in process of time, considerably thickened, as well as much altered in its texture.

Any action of the hock in which these parts are exerted with more than ordinary force, subjects them to curbs; and therefore it is that curbs are so frequently seen in racers after a severe run, and in hunters that have been leaped or hard galloped over heavy ground. By throwing the weight of the rider upon the hocks at a time when they are in violent action, cavalry manœuvres and the manage are common excitants of this disease: the practice of pulling horses up without warning, and of reining them back upon their haunches, cannot, in a medical point of view, be too warmly censured. Many curbs, spavins, thorough-pins, &c. especially in young horses, owe their origin to these exercises.

I cannot agree with Mr. SHIPP in ascribing curbs to blows: the hock is a part but seldom struck *. Horses that are *sickle-hocked* are more subject to this disease than others; hence such hocks are often denominated *curby*—not from their having curbs, but from their pre-disposition to have them.

Recent curbs are generally attended with lameness, which, in some cases, is severe; a circumstance we are not to feel surprised at when we advert to the nature of this disease. Nothing, we know, is more painful than inflammation, followed by effusion, in a tendinous theca—

* SHIPP's *Cases of Farriery.*

a part that will not admit of extension, in which consequently the nervous filaments, preternaturally sensitive already, are necessarily subjected to considerable pressure. Some inconvenience in action may be ascribed possibly to the impeded motions of the tendon. But in curbs unattended from the first with much inflammation, and in those cases where the inflammatory action has subsided, and the parts have accommodated themselves to the remaining enlargement and induration, either no lameness is perceptible, or it is comparatively trifling.

Our object being to subdue inflammation in the part, or, what is equivalent to it, remove the lameness, we are to resort to such means as are best suited to that end: we labor however under some inconvenience here from the peculiar shape and relative position of the hock. For example, we cannot adapt a bandage, nor conveniently any covering to the part by which a cold or warm application—such as a lotion or poultice, can be kept continually applied. We are therefore compelled to substitute another class of remedies, and fortunately for us we have one that is not only as effectual, but much more manageable. Should the part be very prominent and convey much heat to the fingers, it would be advisable, in the first instance, to draw blood to the amount of four or five pounds from the saphena vein, exhibit a purge, and keep the hock continually wet with some repellant lotion *. Seldom, however, is it necessary to institute this preparatory treatment, from which no further benefit is to be expected than some abatement of the inflammation, but we may, in the gene-

* R Sprts: Vini Ten: et Aceti p. æq. Misceque.

rality of cases, without delay, rub a liquid blister upon the curby surface, and repeat it every week or ten days, according to the effect, taking care not to apply a second before the tumefaction excited by the first has totally subsided. The horse ought to be kept tied up in the stable during the operation of the blister; and then turned loose into a box, and a patten shoe put upon the foot of the affected limb, in order to relax the extensors of the hock as much as possible. When the animal has become sound, it is a good practice to give him the run of a paddock for a few weeks, before he be *gradually* inured to his former work.

Though the above mode of treating curbs rarely fails to restore the horse to a state of soundness, it is now and then necessary to fire the parts afterwards, in order to excite absorption of the remaining thickening and induration of them; but not with a view of "*making the parts stand*," as vulgar opinion and professional quackery will have it *. As in all cases where firing is required, the lines should be drawn in the course of the hair—here longitudinally. The farriers of old, and to my surprise, one of our best modern veterinary writers, have directed

* Cases occur, now and then, it is true, that do not appear to be within the power of blisters to restore. But it will be found on inquiry, in most if not all of them, that they are of long duration, have been mal-treated, or not treated at all, or are relapses, not in consequence of the omission of the cautery in the first instance, but from being put to work before the parts have had time to recover their tone. Some will say, perhaps, that horses that are fired at first, "stand better." Granted—but what is the reason of it? Not the firing; but the longer time that is always given to such horses before they are considered fit for duty.

"feather firing for *curbs*" why for curbs, above all other affections, I cannot possibly divine. Surely, those of the profession who have *earned* for themselves such a reputation for firing that they seem to think they have a right to unsparingly cauterize that of their brethren, will not attempt to persuade us also that their irons move in unison with their reasoning faculties, for if they do, we will retort upon them, and say, that their opinions will turn any way so that they "keep their irons in the fire."

ANTERIOR CRURAL REGION.

These, the flexors of the hock, are muscles of much less power than the extensors. Two of them, in bending the hock, will extend the foot, actions that are simultaneously performed in progression. They are all bound down to the tibia by a strong tendinous fascia

Flexor Metatarsi

Lies in contact with the anterior part of the tibia. Below the hock is a triangular space between the two extensor tendons, in which we find an attachment of a few pale muscular fibres that come from the bones of the hock; their use appears to be that of preventing the tendons from rising during action, and of thus contributing to the complete extension of the foot.

Origin. By a tendon of considerable strength, intimately blended with some tendinous fibres belonging to the extensor pedis, from the lower part of the external condyle of the os femoris, and by fleshy fibres, from the whole breadth of the upper and fore part of the tibia. From the last origin is sent off its fleshy belly, but from

the first a theca is derived which partially sheaths the lower portion of the muscle, and completely invests its tendon in front of the hock.

Insertion. This tendinous thecal expansion is inserted into the head of the os metatarsi magnum. The tendon itself, as it emerges from the theca, splits into two: the smaller one is implanted into the os metatarsi magnum, below the attachment of the theca; the larger winds round the inward part of the hock, and is fixed to the head of the os metatarsi internum.

Use. Simply to bend the hock; in doing which it will have a tendency to turn its point inwards.

Extensor Pedis.*

The most anterior of the three muscles situated in front of the tibia.

Origin. From the upper and fore part of the tibia, and by a strong cylindrical tendon, (which principally however belongs to the flexor metatarsi,) from the lower part of the external condyle of the os femoris.

Its belly, which consists chiefly of fleshy fibres, ends in a flat tendon, a little above the hock-joint, in front of which it passes in a tendinous theca of its own, and, upon the anterior surface of the cannon, about one-third of its length downwards, is so intimately united with the tendon of the peroneus that the two appear as but one until they have descended to the large pastern-joint, just above which they disunite and run separate: in their course both are invested in a cellular sheath. In front of the fetlock-joint this tendon spreads out, and its fibres continue to expand in its passage over the pastern and coffin joints.

* Vel extensor *longus* pedis

Insertion. Into the coronal process of the os pedis, and along the upper edge of the bone, between the attachments of the lateral cartilages.

Use. In consequence of this tendon being bound down by a sheath in front of the hock, it will assist in bending that joint, at the time that it is performing the uses for which it is particularly designed, *viz.* the extension of the fetlock, pastern, and coffin joints.

Just below the bend of the hock, from the upper and anterior part of the os metatarsi, comes off a thin layer of fleshy fibres, enveloped in cellular substance, and concealed in part by the tendon of this muscle, into which, about one-fourth of the length of the cannon downwards, they are inserted. They may contribute a little to the extension of the foot, by bracing this tendon when the muscle is in action.

Peroneus *.

This is, properly speaking, a peronæal muscle, and the only one that the horse has.

Origin. From the head of the fibula, continuing to arise from the whole length of that bone.

Insertion. With the former muscle. It is evident from the comparative magnitude of the flexor and extensor muscles and tendons of the foot, that the latter are greatly inferior in power to the former, but, with respect to the hock, the reverse is the case, the design of which is perfectly obvious when we consider what the actions of these different parts are in progression. The extensors have nothing more to do than simply to raise the foot from the ground, and carry it forward under the trunk, the flexors have, in the extension of

* Vel extensor brevis pedis

the hock, not only to keep the foot firm upon the ground, as a fulcrum, but to advance the whole machine, and restore the perpendicular of the hind extremities. This operation has been well compared to the impulsion of a boat by means of oars: supposing the vessel to represent the body of the animal, and the oars the hind legs, the waterman imitates the extensors of the hock while tugging at his oars, and the flexors in projecting them out of the water.

LECTURE XXXI.

On the Ligaments of Particular Joints.

HAVING, in a former lecture *, endeavoured to convey a knowledge of the mechanism and functions of the joints collectively, I shall now direct my attention to them separately.

Articulations of the Trunk.

AND I shall take them into consideration in the order in which the bones have been described.

LIGAMENTS OF THE SPINE. Those between the head and the first and second vertebræ, are

Lateral ligaments, one on each side, a pair that run from the coronoid processes of the os occipitis to the fore part of the body of the atlas, and are fixed at the roots of its transverse processes.

Ligamentum suspensorium capitis is a broad ligament inclosed within the capsular. It proceeds from the body of the atlas, between its anterior articular processes, to the upper border of the foramen magnum of the occiput. It aids in the suspension of the head.

Capsular ligament is attached to the body of the os

* Part I. Lect. xvi. p. 264.

occiputis, around the roots of its condyloid processes, whose smooth convexities it includes, and to the body and anterior articular processes of the atlas: a process is sent up from it below to the ligamentous covering of the odontoid process, which forms a complete partition.

Superior ligament runs from the superior and posterior part of the bony ring of the atlas, to the spine of the vertebra dentata.

Odontoid ligaments are three in number:—the two *long* pass from the sides of the processus dentatus to the inward parts of the occipital condyles; the *short*, or broad one, from the point of that process, along a bony canal, to the anterior and inferior part of the atlas.

Inferior ligament, a broad one, connecting (what has been called) the inferior spinous process of the second vertebra, to a similar projection of the first.

The *capsular ligament* between the first and second vertebræ, is attached to the posterior articular processes of the atlas, and to the anterior of the vertebra dentata, to the processus dentatus, and to the odontoid ligaments; which are interposed between this and the occipital articulation.

In the ordinary movements of the head all the cervical vertebræ more or less participate: it is only in the nodding motion, or sudden *check* of it, that the first joint is particularly called into action. When the nose is carried to one side, and elevated, the odontoid process revolves upon its axis within the annular opening of the atlas.

The ligaments common to the spine are—

Ligamentum intervertebrale, in which consists the chief bond of union between one vertebra and another; and so strong is it, that in our efforts to disunite them,

not infrequently will the bone itself break rather than this substance quit its insertion. It is constituted of numerous short and strong ligamentous fibres, arranged in concentric layers, which run from the anterior or convex part of one bone, and penetrate the concave part of that before it.

Ligamentum commune inferius consists of a band of ligamentous fibres which is passing obliquely along the inferior parts of the vertebræ, spreading upon their bodies, and coalescing with the ligamentum vertebrale.

Ligamentum commune superius runs within the spinal canal, and can only be demonstrated by sawing through the bony arches: it connects the upper parts of the rings together.

Capsular ligaments surround the smooth cartilaginous faces of the articulatory processes.

Intertransverse ligaments fix the transverse processes of the dorsal vertebræ together.

Interspinous ligaments are found between the spinous processes of the back and loins.

Ligamentum subflavum * is an elastic ligamentous substance, extending from the occiput to the coccyx. It arises from a scabrous depression in the os occipitis, behind its tubercle, and there consists of a cylindrical cord; but, as it proceeds along the upper part of the neck, it suddenly spreads in breadth downwards, and is fixed to all the spines of the cervical vertebræ, except the first. It is broadest in front of the withers. As it approaches the tallest dorsal spine it grows narrow again, and, after it has passed the sixth or seventh, degenerates into a band whose greatest breadth is trans-

* Improperly named ligamentum *nuchæ*.

versely. It covers and connects the remaining spinous processes of the back, and those of the loins, sacrum, and coccyx, upon which it becomes gradually smaller and smaller, and upon the tip of the last vanishes altogether. This ligament forms a strong connecting medium between the spines of the vertebræ; and from those of the neck sustains the weight of the head, which must prove a considerable saving of muscular power. Being very elastic, it will admit of the extension of these parts, and do something towards their contraction.

Ligaments of the Pelvis. The last lumbar vertebra is united in the same manner to the sacrum to what the vertebræ are respectively with one another.

Two superior transverse ligaments are fixed to the transverse processes of these bones above; *two inferior*, below, run from the fourth and fifth transverse processes of the loins to the crista of the ileum.

Sacro-iliac symphysis consists of a cartilago-ligamentous substance interposed between, and firmly adherent to, the transverse process of the sacrum and the inward part of the ileum. This union is strengthened by

Ligamentary bands, which run from the posterior spine and border of the ileum to the transverse process of the sacrum.

Sacro-sciatic ligaments are broad expansions, stretched across the sacro-sciatic notch. They arise from the transverse processes of the sacrum, and those of the two or three uppermost bones of the coccyx, and are extended to the posterior parts of the ileum and ischium, and to the tuberosity of the latter. In the anterior part of the notch is an oval opening for the passage of the sciatic vessels and nerves.

Obturator ligament is an expansion thinner than the last, which is stretched, like a drum-head, across the foramen magnum ischii.

Ligament of the symphysis is the cartilago-ligamentous substance which unites the ossa pubis et ischii, at the inferior part of the pelvis, to their fellows of the other side.

The common vertebral connection exists between the sacrum and coccyx, and between the several pieces of the latter.

I shall here make some observations on another operation of the tail, called

Docking.

As a man of fashion is known by the cut of his coat, so a horse gives evidence of the equestrian spirit of his rider in the trim and length and carriage of his tail.

In this country it is customary to dock all but cart horses *, and generally at an early period of life; but the breeders, or country horse-dealers, who do this, seldom cut more off the tail than to deprive it of most of

* Many years ago was, and I believe now is in some places, the practice in Norfolk and Suffolk to dock draught horses *short* on some, not leaving more than three or four inches of tail, and many of these horses, employed to draw two or four oxen, used to be trimmed half way up the dock, by way of *improving their appearance!*

† Some breeders of the present day make a practice to dock their foals soon after they are dropped, with a prospect that the hair of the stump will grow strong and thick. I cannot take upon myself to offer an opinion on this point, but there is only one consideration which ought not particularly in situations where herds is scanty or wanting, to be lightly passed over, and that is the use that is made of the tail in switching off flies and other annoying insects from the skin, in the summer and autumnal seasons.

its long hair; so that the operation is again required when the animal enters the metropolitan mart. Here the dock is shortened according to the prevailing fashion of the day: and if this should not happen to coincide with the cut of his purchaser, the unfortunate creature is subjected anew to torment: so that there is reason to believe that many horses are even thrice docked. With regard to the expediency of docking, I have nothing to do: it would ill become me, as a professional man, to decry the operation; and it is enough for us to know, that a practice, seemingly introduced by fashion, has become established by custom, and that we are often called on to put it in execution.

The performance of this operation is at the present day held to be so simple, that I will venture to say, there is no cunning groom, nor horse-dealer, but what would think it supererogatory, nay even derogatory, to peruse a book on this subject; but, however facile the amputation of a portion of tail may be (and certainly the docking knife appears to have reduced its simplicity to the utmost) a scientific acquaintance with the operation and its consequences, must always give the professional man a superiority which no one is better able to rate than himself.

In the memory of some, who have been many more years in the profession than I have, it was the practice to *chop off* the tail: the horse was placed with his quarters against a rail or post, upon which the tail, being extended, was divided by striking a knife through the dock with a mallet or hammer. To whom or what we owe the origin of the present improved method of amputation I know not; but certainly the docking knife now in common use is exceedingly well adapted

to the purpose, and is, probably, altogether as convenient and effectual an instrument as can be constructed.

When a horse is to be docked, the first, the primary, the momentous question is, "what is to be the *length* of the dock?" So much does this vary with the size, kind, and general conformation of the horse, and with the prevailing fashion or caprice of the day, that I find it ranges from six to fourteen, and even fifteen inches. With no ambition nor pretensions to "set the fashion," and with but little to offer in favor of either side—

"Non nostrum tantas componere lites—"

I would submit, as my opinion, that nowadays it is too prevailing a custom to "dock short" our hunters and roadsters, and more especially mares. In the two former, to my fancy, this extreme decurtation of tail detracts greatly from the symmetry of the hind quarters, and not inconsiderably trespasses upon the majesty of the *tout ensemble* of a horse of noble and lofty carriage, and as to the latter, there is something really indecent about the unnatural nudity of those parts!—but I forget that our modern sportsmen will not agree with me—and now I am under apprehensions that some of them may deem this digression *unsportsmanlike*; and therefore I will say no more about it.

Having determined on the proposed length of the dock, the first step towards the operation is to collect the long hair growing over the place of amputation—which will be best ascertained by a common rule, and to plat it, if it is long enough, or bind it if not, and confine it by ligature to the upper part of the tail. Next, clip or shear off the short hairs close around the

dock, where the knife will be applied, and finally amputate the tail; the mode of doing which, with the instrument now in use, requires no explanation here: the operation so far is simply mechanical, and owes its success to a little dexterity and strength of arm.

No sooner is this done than the blood spirts out to some distance from the three coccygeal arteries; and generally sundry other hair-like streams issue from their surrounding branches. In this stage of the operation two interesting questions present themselves. First, is it necessary to suppress the hemorrhage? And, secondly, if it is, what are the preferable means of so doing? That many colts are docked, and turned out afterwards, without making use of any styptical means whatever, with no apprehension on the part of their owners, is a fact that would incline us to abandon them; but, independant of the risk that I shall show would be incurred by such a practice at the adult period, in horses who had already undergone the operation, and in whom consequently the blood-vessels had increased in size, and most probably in number, the time alone required for rest after amputation, in order that the bleeding vessels might be safely plugged, is a weighty objection to it *. The same arguments hold good

* In order to ascertain the quantity of blood a horse might lose in this manner, and whether there were really grounds for alarm under such circumstances, I made the following experiment; the subject of which was a fine, healthy, young horse, in fat condition, condemned to slaughter in consequence of an incurable lameness of the shoulder. His present dock was ten inches long; and he had not been nicked. Having trimmed the root of the dock, I amputated eight inches of it, with the common docking knife. Instantly the blood spirted out in five distinct streams; two of which were

against the temporal employment of ligature around the dock, or a tourniquet, in addition to which may be urged its occasional ineffectualness in completely arresting the hemorrhage, and the injury which long and violent compression is apt to be productive of. Some would wrap the tail in bandages, pledgets of tow, &c. either dry, or wetted with some astringent lotion; but the trouble of applying them, the time required for the arrest of the bleeding, and, after all, the uncertainty of the event (for I know of no styptic application that can be depended on) are sufficient reasons for rejecting the practice. Less objectionable than either of these methods is that of tying the three principal coccygeal arteries: sometimes they may be readily seized with a tenaculum and tied, but, every now and then, when the dock has been cleanly severed, these vessels, or one or two of them, have retracted so far that it

extremely fine, and came from collateral branches. The three others issued from the coccygeal arteries, but that from the arteria media surpassed in size and force both of the others, emitting its blood in a quick and jetting or pulsating stream. In ten minutes, those from the branches degenerated into droppings, and the middle artery still emitted more than both the lateral together. In fifteen minutes more, five quarts and a pint of blood had escaped. During the next twenty five minutes he lost but one gallon, and in the subsequent forty-five, only three quarts, making altogether twelve quarts and one pint. The lateral streams first grew very fine, and then ceased, that in the middle ran for a quarter of an hour after their cessation. The animal, in consequence of the vanity of the currents, and the length of time the blood took in flowing, shewed no signs of faintness or uneasiness. Six hours afterwards, though he had been kept tied up, the hemorrhage returned from the middle artery, and continued until he was destroyed, which took place in the course of the succeeding hour.

is a very nice and difficult task to lay hold of them and draw them forward without rupturing their coats, and even an impracticability unless the animal be cast, or be very quiet in the stall. The means now, everywhere I believe in this country, employed to staunch the blood, is the actual cautery; and certainly, the simplest of application, the most effectual, and the safest, it is. There is only one objection that can be urged to its use; some may not regard it as such, but I consider it to be one of great moment, inasmuch as it is grounded upon that which a veterinary surgeon ought never to lose sight of in the course of his practice—humanity. The animal will often literally shriek with agony—and really in the present unskilful and barbarous manner in which that terrific veterinary surgical instrument—a red hot iron, is made use of, I do not know what can excite more exquisite and poignant pain. Let me implore veterinary surgeons then to take this into their most serious consideration; and not to trifle with the feelings of a poor brute, who, if he could in language retort upon them, would accuse them, and with the greatest justice, of cruelty grafted upon prejudice. The ordinary method of cauterization (one would think we were a profession of savages) is to hold the dock firmly and fixedly flexed backwards in the left hand, so that the bleeding surface be presented directly upwards *, and then, with a bright red hot iron in the right, which will come in contact with every part but that which is insensible—the bone, to sear it with all possible force of application, so that the skin, (which does not deserve this harsh treat-

* Searing the dock in this position, it is vulgarly supposed, conduces afterwards to the elevation of the tail!

ment, for it has not bled,) the cut bellies of the muscles where they contain no arterial trunks, and the naked nerves, are all fried together; but the torture does not end here; in order *to prevent a return of the hemorrhage*, the roasted extremity of the dock is now besprinkled with pulverized resin, and this is melted upon it by the re-application of the hot iron: in this way, the quivering tail is converted into a lighted torch, and the sanguinary scene is concluded! Nevertheless, the actual cautery is the simplest means, the safest, and the most effectual we possess to staunch the hemorrhage. These advantages, which are great to the private practitioner, might induce me to hush up the sufferings of the animal, were it absolutely necessary that the practice, as here described, should be carried to such a pitch; but, when it is found that the torture may be reduced to pain of much less severity, and shorter duration, and that the same advantages may be insured, surely humanity has a right to cry aloud, and surely we are brutal if we do not lend our ears to it! Let the iron, instead of being broad enough to cauterize the posterior aorta, and to sear parts of exquisite sensibility which do not bleed, be of such dimensions and so shapen, that it may touch the mouth of the bleeding vessel *only*; and let it be at a *dull* red heat, instead of being flamingly red hot. will not, then, the sufferings of the patient be greatly diminished and abridged? Yes! I answer; and your purpose equally and completely effected. I am not now writing for those who know no more about the structure of a horse's dock than they do about the construction of a dock for a ship, but I am desirous to strike the minds of my professional brethren with the preference that ought always to be given to a scientific practice—nay,

the policy of it, and the bounden duty of us all to institute as humane a one as is adequate to its ends. One of the most obvious advantages of the cautery, over all other styptical means, is, that the horse may safely be put to work immediately after an operation which requires but a few minutes for its accomplishment.

It is but very rarely that we hear of any ill consequences after docking; and those that have been known to occur are, in my opinion, attributable to the unnecessary severity practised in the operation. The sloughing of the extremity of the stump, which, of course, must take place, now and then goes on untowardly; when it must be treated accordingly. Tetanus has resulted from docking. Here I would, at the onset, amputate the dock higher up, with a very sharp instrument, but *not* sear it afterwards: should the hemorrhage, which I would at first not meddle with, prove alarming, the principal arteries may be secured by ligature, or a tourniquet or tight bandage may be applied. These accidents are more likely to happen in frosty weather, from that being unfavorable to the healing process; it is as well therefore not to operate during frost, unless the animal be kept the while warmly housed.

Ligaments of the Ribs. Every rib is connected to two vertebræ by four ligaments.

Capsular ligament of the head invests and holds it within its vertebral socket. Two articular cavities are formed within it, one with each vertebra, which have separate synovial linings. This union is strengthened by some ligamentous fibres that proceed from the summit of the head.

Capsular ligament of the tubercle surrounds it at its articulation with the transverse process of the vertebra.

External and internal ligaments consist of strong fibres which connect the neck of the rib, above and below, to the spine.

Intercostal ligaments are broad fibrous bands which run obliquely across the intercostal spaces, and hold the ribs and their cartilages firmly together.

Sternal ligaments. The several pieces of the sternum are united to each other by intervening cartilago-ligamentous substances, in addition to which they are connected by ligamentary bands, both inwardly and outwardly. The fore part of it is surmounted by a broad portion of cartilage, which runs along its under part, somewhat like the keel of a ship: this is the *carniform* cartilage.

Articulations of the Fore Extremity.

Shoulder-joint is composed of two bones:—the scapula and the os humeri. Their adaptation to each other is incomplete, in consequence of the comparative magnitude of the ball of the one and the socket of the other; though the superficies of the cavity is somewhat extended by a narrow border of cartilage.

The *capsular* being the only ligament connecting these bones, we find that it is strengthened in many places by additional fibres dispersed upon its exterior. It is very loose-bagging about the bones, that it may not restrain their motions. It is fixed to the rough margin of the glenoid cavity, and to the neck of the os humeri. A synovial membrane lines it, which may be followed upon the cartilaginous surfaces of the bones. Externally this ligamentous capsule is clothed on every

side by muscle:—the antea et postea spinati invest its outer and anterior parts, the subscapularis and teres minor, its inner and posterior: to them is attributable the main strength of the joint.

The os humeri may be freely flexed backward upon the scapula, but cannot be extended forward beyond that line in which we see it placed in the skeleton. It may be abducted or adducted a little, and, but very limitedly, rotated *.

Elbow-joint † consists of the os humeri, the radius, and its epiphysis, the ulna. The ligaments of it are two lateral, and a capsular.

Internal lateral ligament is implanted above into a depression upon the side of the internal condyle of the os humeri, and below, by two portions, into the margin of the inner articular concavity of the radius, and into its body, about three inches lower.

External lateral ligament, shorter and stronger, runs from a similar depression upon the external condyle to a tubercle upon the upper part of the radius.

Capsular ligament, which is thin, is affixed to the condyles of the os humeri, including the smooth parts of those projections and the hollow behind them, to the edge encircling the top of the radius, to the lateral ligaments, and to the ulna around its articulation: it is also attached to that tendinous substance by which the flexors of the leg have their origin. The

* A horse evinces these powers in the *passage de manege*—in turning round by his hind legs, making pivots of his fore—in turning his toes in or out in going, &c.

† So denominated, from the projection of the olecranon, in the phraseology of the riding school.

lateral ligaments, as well as the capsular, and other parts, receive a synovial lining.

The motions of this joint are confined to flexion and extension.

In the young subject the ulna is joined to the radius by a strong, fibrous, elastic substance, of a cartilago-ligamentous composition, which yields to the instantaneous recoil of that bone, in extraordinary efforts, during action. From its tubercular end a ligamentous band runs to the knee. Ossific matter unites these bones in the adult, and the ulna becomes a fixture.

So long as it is moveable, this joint co-operates with other elastic parts in preventing concussion.

Knee-joint. In the knee there are five distinct articulations:—one between the radius and the three small bones of the upper row, a second between the small bones, above and below; a third between those of the lower row and the metacarpal bones; a fourth between the os trapezium and the os cuneiforme; and a fifth between the os pisiforme and the os trapezoides. They have all separate capsular ligaments, and synovial linings.

The ligaments of the knee, and the tendons passing over it, are girt by broad, glistening, ligamentous bands, which retain the latter in their places, and render the joint stronger and more compact. Between these ligamentous fasciæ in front and the extensor tendons, are some large bursæ, that facilitate the play of the latter.

External lateral ligament is that which runs from a tubercle upon the radius to the head of the external metacarpal bone.

Internal lateral ligament consists of two parts, which proceed from a similar tubercle upon the inside, and

from the body of the radius:—the *longer* is fixed to the head of the internal metacarpal bone, the *shorter* and broader to the inner and fore part of the large metacarpal bone.

Ligamentum annulare passes from the os trapezium to the ossa scaphoides et cuneiformia: it confines the flexor tendons.

The motions of the knee, which reside chiefly in the two upper large joints, are complete flexion backward, and extension. To have given this part lateral motion, would have endangered the security of its joints.

I have heard it said, that the knee of a horse was luxated in galloping down a steep hill in the chace; but as there is no professional attestation of such an accident, I must withhold my belief of the fact: it is extremely improbable that any one of the bones of the main joints was actually driven from its place.

Cases present themselves now and then in which the bursæ in front of the knee are dropsical and enlarged: they seldom or never give rise to lameness.

Fetlock-joint. This joint is composed of the os metacarpi magnum, the os suffraginis, and the ossa sesamoidea.

Capsular ligament is attached around the articulatory surfaces of these bones; and the synovial membrane, after having lined it, is reflected upon their cartilages: it is guarded in front by the extensor tendon.

Long lateral ligament is fixed to a little projection upon the side of the os metacarpi magnum, and to the os suffraginis.

Short lateral ligament, running underneath the former, arises from a depression in the os metacarpi mag-

num, and is inserted into the bone below, immediately behind the long one. Being short and tense, when the joint is extended, these ligaments will guard strictly against any motion sideways, which would necessarily give a tendency to dislocation.

The ligaments of the sesamoid bones are seven:—the superior or suspensory, the long inferior, the short inferior, the two lateral, and the two crucial.

Suspensory ligament, so called, I imagine, because the ossa sesamoidea are suspended by it, is one of the strongest ligaments of the body, and differs from most others in having the property of elasticity. It commences from a projection upon the upper and back part of the os metacarpi magnum, passes down, in a cellular sheath, between the ossa metacarpi parva, (filling up the space between them,) and opposite to their tubercles splits into two portions, which are implanted into the outer and posterior parts of the sesamoid bones, and into the cartilaginous substance uniting them. From it two lateral slips of ligament are continued down to the extensor tendon. Enveloped in adipose membrane, between it and the lower part of the os metacarpi magnum, are several bursæ mucosæ.

This ligament exhibits a remarkable aspect when cut into, from having a peculiarity in its composition which would almost incline one to doubt how correctly it is regarded as such. Bourgelat has treated of it as a tendon *; Girard, as a muscle †. It is deeper in color than either ligament or tendon in general; it is fibrous, but its fibres are very coarse, and are disposed in layers; but its essential difference consists in an in-

* Le tendon suspenseur du boulet. † Métacarpo-phalangien.

tertexture of fine, red, muscular fibres, which appear to be the uniting medium of the others. This intermixture of muscle, in the composition of the ligament, in itself elastic, must greatly contribute to its power of contraction, after having been forcibly extended by the depression of the sesamoids; and nothing can more vividly elucidate my remark, in speaking of those bones, than this singular and unique structure. "The suspensory ligament by its re-action, instantaneously after extension, we feel inclined to believe, *aids the flexor muscles in bending the pastern-joints:* the astonishing activity and expedition displayed in the movements of the race-horse, at speed, seem to be referable, in part, to the promptitude with which the suspensory ligament can act before the flexor muscles are duly prepared; the latter, we should say, *catch*, as it were, and then direct the limb, first snatched from the ground by the powers of elasticity *."

If the tendons of the flexor muscles of the pasterns and foot are cut through, these joints become relaxed and the animal walks, and with tolerable freedom, upon the protuberant heels of the horny frog and posterior parts of the wall; but if the suspensory ligaments too are divided, the joints then being entirely deprived of their support behind, the toe of the hoof turns up, the pasterns are forced down horizontally upon the ground, and the animal actually walks upon his fetlocks, without much chance of falling so long as he is not hurried out of this pace. This proves to us, that the suspensory ligaments are the real braces, not only of the fetlock, but of the pasterns, and that, in consequence of the sesamoids

* Part I. page 334.

being deprived of their means of suspension, these joints sink down, and are protruded, or, in the jockey's phrase, are "let down." Concerning their operation, during action, I have already made some observations in my lecture on the skeleton *.

Long inferior ligament, runs from the bases of the ossa sesamoidea, along the back part of the os suffraginis, to the upper extremity of the os coronæ. This ligament will assist in retaining the sesamoid bones in their places, and materially strengthen the pastern-joint behind; but, in my opinion, this does not comprise one chief design of it. In consequence of its being spread over the pastern-joint, and the obliquity of that part in the skeleton, I imagine that, in action, it is forcibly impressed by the lower end of the os suffraginis; to which impression it would be incapable of yielding, were it not attached above to the sesamoid bones, and did it not, through them, exert an extensional action on the suspensory ligament: so that the operation of this much admired structure, to ward off concussion, is not confined to the fetlock, but, by means of the long inferior ligament, is in part transmitted to the pasterns.

Short inferior ligament arises, by two portions, from the bases of the ossa sesamoideum, partly concealed by the long ligament, and furnished with bursæ as it passes over the projecting parts of the os suffraginis. It is implanted, a little lower down, into an angular asperity well marked upon the os suffraginis. It binds the sesamoid bones to the large pastern, and strengthens the fetlock.

Lateral ligaments are extended from the outer, pro-

* Vide Lecture xx. Part I

jecting angles of the ossa sesamoidea, in part to the os metacarpi magnum, and in part to the os suffraginis: binding these parts closely and strongly together.

Crucial ligaments are a pair brought into view by dissecting off the inferior. They run, decussating each other, from the bases of the ossa sesamoidea to the upper and posterior or projecting parts of the os suffraginis. In metaphorical illustration of the use of these ligaments, I would call them the *hinges* of the sesamoid bones—the connexion upon which they turn in performing that retro-cession I have heretofore ascribed to them.

No part is oftener the seat of lameness than the fetlock and its appurtenances; for there is no articular part more complicated in its construction. In horses brought to us for "sprains of the back sinews," we too commonly regard the flexor tendons as the only seat of injury; without reflecting that such is the deep-seatedness and concealment of the subjacent parts that their diseases can seldom be detected but by nice and accurate taction, and even then, but too often, in a very imperfect manner. In a great proportion of these cases, where much violence has been the fore-runner, I imagine that the suspensory ligament must be sprained; and in the worst cases, probably some of its fibres even ruptured: but owing to the quantity of the cellular membrane investing it, its depth of situation, and the occasional subcutaneous extravasation consequent upon the injury, the case will put on all the appearances of a common sprain, and, fortunately for the practitioner, require then the same course of treatment *.

* Vide Lecture xii. Part I.

The joint itself, from its being the chief seat of motion below the knee, is very subject to inflammation; generated in it either by long endured exertion, or by occasional acts of violence. I have seen a few cases in which this has speedily terminated in an accumulation of synovia—*hydrops articuli*—giving rise to a little puffiness in the joint itself, and to a snapping noise on motion of it, as if the cannon bone left its socket every time the limb was elevated, and slipped in again on its being grounded. This dropsical condition of the joint is often accompanied by a similar one of the large bursæ interposed between it and the suspensory ligament; and in the course of time, more especially if the animal continue to work, a communication is likely to be established, by absorption, between them. For the treatment of these cases, and the further consideration of the subject, I must refer to the lectures on the diseases of joints, and bursæ mucosæ.

Pastern-joint is formed by the adaptation of the ossa suffraginis et coronæ. It has a capsular, and two pairs of lateral ligaments.

Capsular ligament infolds the smooth cartilaginous ends of these bones, and is firmly inherent in their borders: it is intimately blended with the extensor tendon in front, and behind is inseparably united with the long inferior ligaments of the sesamoids.

Long lateral ligaments are rooted in rough surfaces upon the sides of the os suffraginis; whence they proceed to the os coronæ.

Short lateral ligaments, broader and stronger than the former, are attached, anteriorly to them, to the bones above and below.

The long inferior ligament of the sesamoids protects this joint behind, and the extensor tendon forms a broad defence to it in front, indeed both these bands are so knitted in texture with the capsular ligament that they may be said to constitute the greatest part of it.

The motion of this joint is very inconsiderable. It is every where evident in the construction of this and the joint I have but now described, that the chief design has been, to confine their movements to those of simple flexion and extension; otherwise, unprotected as they are by muscle, they must have been insecure, and unfit for the purposes of supporting, moving under, and propelling, a burden of several hundred weight. Dislocation in them is an unheard-of accident; but, as might be expected, their ligamentous connexions are often the seat of inflammation, which, unless it be early met by efficient remedies, never quits them until it has laid the foundation for that irremediable evil, ringbone *.

Coffin-joint is made up of three bones:—the ossa coronæ, pedis, et naviculare.

Capsular ligament inwraps their articulatory surfaces, and fixes itself beyond their limits. in front it is inseparably united with the expanded extensor tendon, behind it is much strengthened by the tendo perforans. In addition to the capsular, there are three pairs of ligaments.

First pair passes from the superior edges of the alæ of the os pedis, to the lateral parts of the os coronæ, and are inserted about its middle.

* I allude to that ringbone which, from its situation, interferes with the motion of one or other of these joints. Vide Lecture xx Part I.

Second pair is stretched from the extremities of the alæ to the os coronæ, and are fixed below and behind the first.

Third pair arise from the sides of the coronal process, and terminate in the cartilages.

The ligaments of the os naviculare are four:—two single, and one pair.

Superior ligament runs from its upper and posterior part to the tendo perforans.

Inferior is a very broad ligament; arising from the whole of the lower edge of the bone, and thence extending across to the body of the os pedis, above the long extensor tendon.

Lateral ligaments fix the os naviculare, by its two ends, to the sides of the os coronæ.

The coffin-joint is not furnished with lateral ligaments of equal strength to those found in the pastern and fetlock, and for this reason—because it lies buried within the hoof, where it is well protected from external injury, and where it is impossible to be luxated. It has no other motions than flexion and extension, and them but limitedly; less so, however, than the pastern-joint. I forbear here to offer more on the functions of these parts, as they must necessarily come again under notice in speaking of the foot; and probably it will be judicious to reserve until then what I have to say about their diseases *.

* In Part I page 311, I have said, *that I never saw or heard of a case of fractured navicular bone.* Since the publication of the first Part, I have been favoured with the inspection of two specimens of this accident, which are now in the possession of Mr Field. The fractures, in both, it appeared to me, had their origin in caries of the bone.

Nothing can afford me more satisfaction than the retraction of

Articulations of the Hind Extremity.

THIGH-JOINT is formed by the reception of the ball or head of the os femoris into its socket, the acetabulum of the pelvis.

Capsular ligament, which is very thin, and incapable of great resistance, is attached around the cervix of the os femoris, and the margin of the acetabulum; it is thickly clothed on every side by muscle, which is a defence and an effectual security to the joint.

The acetabulum is surrounded and deepened by the *circular ligament*: whose border turns inward to embrace the cartilaginous head of the os femoris.

The *notch* in this cavity, to its inward side, is crossed by the *transverse ligament*, which here makes up for the deficiency in the bone.

Ligamentum teres consists of a bundle of ligamentous fibres, inclosed in a sheath, which proceed from a pit in the inner and upper part of the ball to a similar one in the roof of the socket: another portion of it leaves the cavity under the transverse ligament, and is implanted into the pubes. This ligament holds the bone, when its capsule is ruptured. The synovial membrane, after having lined the socket, is reflected over these parts.

STIFLE-JOINT is composed of the os femoris, the tibia, and the patella. Its ligaments are many, and particularly worthy of notice, from its being the occasional seat of lameness, (which is often deemed or proves incurable in consequence of the nature of it not being

correction of such-like statements, so soon as I may have been warned of my error. None of us are at all times faultless; and those who write on many and various subjects, are generally most subject to error, and ought to be most pardonably so.

understood,) and from the liability of the patella to displacement.

Those external to the capsular ligament are the *ligamenta patellæ*—four strong cords, which descend from the lower part of that bone, over the condyles of the os femoris, to be fixed to the tubercle of the tibia. The *external* one passes upon the outer and anterior part of the external condyle, the *internal* upon the inward part of the internal condyle, and the *middle* one, between them: they approach one another in their descent. Concealed by the external one is the *fourth ligament of the patella*: it runs to the outward part of the tibia.

The patella, with the pulley-like articulatory surface of the condyles in front, forms a joint of its own, perfectly distinct from that between the tibia and os femoris.

Its *capsular ligament* is fixed to its surrounding border, and includes the smooth parts of the condyles which the bone slides upwards and downwards upon: to admit of this motion, the capsule is very loose, and a quantity of adipose matter fills the interspaces of the ligamenta patellæ.

Internal lateral ligament descends from the internal condyle to the inner and upper part of the tibia.

External lateral ligament, stronger than the internal, runs from the external condyle to the upper end of the fibula.

Capsular ligament of this joint is loose and thin. It is inserted around the condyles of the os femoris and the uppermost part of the tibia: it is also attached to the lateral ligaments, and to the semilunar cartilages.

Within the capsular ligament, partially dividing the cavity, we find the *semilunar cartilages*. They are of a crescentic shape, seated upon the articulatory surfaces

of the tibia, thick around their borders where they are attached, thin inwardly and loose within the joint. The use of them appears to be, to form *sliding* sockets for the condyles.

The ligaments of the cartilages are—the *two anterior*, which are implanted into a pit upon the fore part of the tibia; and the *three posterior*, of which one attaches the inner cartilage to a rough depression upon the tibia, the two others bind the outer cartilage to the hollow behind the condyles, and to the back of the tibia.

These cartilages admit of additional freedom of motion, and diminish the risk of dislocation.

Crucial ligaments, short and strong, and deeply buried within the joint, run from the space between the condyles to scabrous pits upon the tibia.

The synovial membrane after having lined the capsule, is reflected upon the cartilages and ligaments included within it.

Hock-joint, like the knee, is everywhere invested by a cellular covering, interlaced with ligamentous bands, which sheathe and confine the tendons as they pass over it in a manner already described.

It has four lateral ligaments:—two on each side. Of the *two internal*—the *long one* runs from an eminence upon the lower part of the tibia to the astragalus, thence it spreads upon the ossa cuneiformia, and is ultimately fixed to the internal small, and also to the large metatarsal bones; the *short one* proceeds from the same eminence upon the tibia, crossing under the long one, to the os calcis.

Of the *external lateral ligaments*—the *long one* runs from the opposite part of the tibia to the os calcis, ex-

pands upon the ossa cuneiformia, and terminates upon the internal small, and large metatarsal bones; the *short one*, taking a cruciform course under the former, is fixed to the tibia above, and astragalus below.

Capsular ligament, everywhere thick and strong, includes the lower end of the tibia, and the pulley-like part of the astragalus; to both of which bones, to the lateral ligaments, and to the os calcis, it is firmly attached.

The astragalus is retained in its place by *lateral ligaments* which are fixed to its sides, and thence pass to the metatarsal bones. It is closely attached by separate capsules to the os calcis, and cuneiforme magnum, with which it forms distinct articulations.

The os calcis forms a joint with the os cuboides, upon which it rests. It is bound in its situation by *short ligaments* with the astragalus, tibia, and metacarpal bones.

The ossa cuneiformia are themselves in joint-like apposition; and the middle and small bones make joints with the os cuboides above, and the ossa metatarsi below.

So that there are no less than six articulations in addition to what we commonly understand by *the* hock-joint—that between the tibia and astragalus. And with great reason do we so designate it; for by it are the motions of this part, which are restricted to flexion and extension, almost wholly performed. This joint probably has more exertion to endure than any one in the body; at the same time it has to admit of free and extensive motion: had this motion been variable, as well as extensive, a more complicated structure would have been required; not only from the nature of the articulation of

the bones is lateral motion prohibited, but it is carefully guarded against by a double number of lateral ligaments, and by their decussation. This joint is well defended, and further strengthened, by the tendons that run over it. It is the seat of several diseases which I have already made the subject of inquiry: an additional argument, in my mind, to show its utility in progression.

LECTURE XXXII.

On the Common Integuments.

UNDER this head the ancient anatomists included the cellular membrane and the panniculus carnosus, which they called the *muscular* membrane; but, by the modern acceptation of the word, *integuments*, nothing more is meant than what, in common language, is called *skin*: the epithet *common*, which is mostly prefixed, only serving to denote their uniformity over every part of the body. In human anatomy the hair and nails are generally described as appendages to the skin, and, to carry on the analogy, I might thus consider the hair and hoofs, whose nature is equally cuticular; but the hoofs, when compared with the nails, are parts of so much more importance, and are parts which, of late years, have excited so much interest in veterinary anatomy, that, I think, it would be injudicious to link them in description to any organ as an appendage.

The common integuments consist of three parts, which differ in appearance, texture, and organization from one another:—the *cutis*, *cuticle*, and *rete mucosum*.

The Cutis.

The *cutis* vel *dermis*, sometimes designated the *cutis vera* or true skin, is the most substantial constituent of the common integuments, being that which the tanner converts into leather: it lies underneath, and may be said to be (in the full sense of the word) the support of the other two.

The cutis is attached to the subjacent parts by reticular membrane, in some places so tensely that little or no motion is admitted of, in others so loosely that it may even be thrown into folds:—about the forehead, upon the back and quarters, around the dock, and upon the pasterns, it is so tight that we can but with great difficulty include a portion between the finger and thumb; but, upon the side of the face and neck, upon the ribs, under the belly, and upon the arms and thighs, it will easily admit of corrugation; indeed, between the fore legs are several semicircular doublings of it, in order that the action of the fore extremity may not be constrained; and along the posterior part of the belly, and about the flank, are other folds, not so numerous, but of larger size, that give freedom of motion to the hind parts: in fact, wherever the panniculus runs it is loose, or that muscle could not have imparted to it the power of corrugation.

There is considerable variation in the thickness of the skin, not only where it covers different parts in the same individual, but in horses of various breeds. What a contrast there is, for instance, between the skin of the cart horse and that of the racer! And there appears to be, in this respect, some connexion between the cutis and the hair; for the skin, as well as the coat, of

a black horse are coarser and thicker than those of a horse of the same breed of another color, and it is rather uncommon to see a black racer, whereas the color is predominant among our large, heavy, cart horses. The skin is thinnest and softest in those parts that are either thinly clad with hair, or are quite hairless:—such are the lips, the nose, the interior of the ears, the borders of the eyelids, the inward part of the thighs, and the generative organs.

The cutis vera itself is white; its apparent color it derives from the rete mucosum, of which we have evidence in those horses in whom that membrane is also colorless:—these are the milk-white and cream-colored races; in pieballs, it appears white also in places where the hair is white. But in order to show that the cutis does not vary its color with the hair, it will be found that, whether it be taken from a bay, a chesnut, or a black, when deprived of its other constituents, the skin in all will exhibit the same pale white aspect.

The cutis is of a fibrous texture, tough but supple, elastic, very vascular, and highly sensitive. Its fibres, which take every direction, are so intimately interwoven and knitted together that it is a texture that has considerable strength, a fact we have abundant proofs of both in and out of the body; and that these fibres are elastic is plainly shown by its returning to its former dimensions after having been folded in those places where muscular fibre can have no action upon it; in fact, by this property it is chiefly that the skin so nicely adapts itself, both as a partial and general covering, to different parts of the body under the variations of bulk and shape to which they are liable from position and condition. From what I have been able to learn in

my examinations of the cutis, I should say that its structure was substantially the same as that of the human subject. It appears to consist of a dense substratum of cellular tissue, with which are interwoven fibres of a ligamentous nature, in such a manner that innumerable *areolæ*, like the meshes of a net, are formed in it: these areolæ open, by correspondent pores in the cuticle, upon its external surface, and are for the purpose of transmitting thither blood-vessels and absorbents, of giving passage to the hairs, and of lodging the various emunctories and secretory organs of the skin.

Few organs are more vascular than the cutis—scarcely can a pin be introduced into any part of it without drawing blood; but its vessels are small, indeed, generally speaking, so minute that they do not carry red blood. On close inspection of it, after the cuticle and hair have been removed by maceration, multitudes of little rounded eminences may be seen upon its outward surface, with depressions between them: these are readily reddened by injection with size and vermillion, and are resolvable into vessels, nerves, and cellular substance. In allusion to their shape they may be called *papillæ*: but they certainly do not deserve the name of papillæ *nervosæ*: they may be regarded as excretories of the perspirable matter, and as points endowed with great sensibility; but I do not consider them in the light of veritable *organs of touch*. I know it is common, among professional men, to say, that "the *lips* of the horse are his *organ of feeling*, performing a like function to the *fingers* of a man;" but I believe that this assertion is not well founded: the lips most unquestionably have a more delicate sense of feeling than most other parts; but may not this be accounted for by their hairless and thin and fine integument? Of most objects, the horse takes

cognizance by inhalation; and it is yet doubtful in my mind, whether he can really be said to be in possession of any veritable *organ of touch*: if he is, a peculiar nervous structure similar to what endows our fingers, or something like it, ought to exist about the muzzle, but it has only yet been *verbally* shown to us. The sole of the foot is plenteously supplied with nerves—no part more so; but no horseman will contend that the animal can feel any thing more through the hoof than the more obvious properties of the surface upon which he treads!

The skin also abounds in absorbents. In places where it is thin, the superficial lymphatics, which are supposed to take their origin from its areolæ, are comparatively large, and their trunks, in the subcutaneous tissue, are readily found and injected: thus we see why the eruptions of farcy mostly make their appearance upon the inside of the thigh and arm, about the breast, lips, and sheath, and why, when medicine is administered by inunction, in the human subject, these are the parts chosen for perfrication.

Of the infinity of pores which the skin has upon its surface, probably the greater number transmit hairs; but there are numberless others, smaller and consequently less distinctly seen, from which a vapor is continually emitted, *the insensible perspiration*, called the *perspiratory pores*: the condensation and collection of this exhalation, in form of drops of sweat, upon parts that have little or no hair, serve to mark their situation; they may also be rendered visible by putrefaction or maceration. Again, there is another set of pores of larger size, more discernible in some places than in others, which are the mouths of so many follicles:—the nose has them of large size for the secretion of mucus; the auditory passages are furnished with many of them

—*the glandulæ ceruminosæ*, from which issue a waxy matter; and those parts of the skin subject to friction are, in particular, beset with these pores: in fact, the unctuous matter furnished by them every where preserves it soft and supple, and in some places keeps up a constant greasiness of the surface.

The skin at the bend of the knee and hock has a secretion of this nature, which, from irritation, now and then is augmented, and from want of cleanliness becomes inspissated, and collects about these parts, and, if the incrustation be not disturbed, generates a foul ichorous sore: lameness, of course, will result from this whenever stiffness or pain is felt in flexing the limb. When the bend of the knee is its seat, grooms call it the *mallenders*; but, when the front of the hock is thus affected, the *sallenders*. Almost all our treatises on farriery contain some *specific* recipe for it. Nothing more is required to be done however than to cleanse the part from the scurf or scab that may infest it, by soaking it in hot water; and correct any morbid disposition the skin may have to emit matter, differing in quantity or quality from its natural secretion, by anointing it daily with some astringent ointment *, which, at the same time, will render it soft and pliable.

The skin of the heel of the horse, like that of the axilla of the human subject, has very many of these glandular pores; through them oozes an unctuous secretion, of a peculiar odor, to which the remarkable softness and suppleness of that part is owing; and an unusual flow of this matter, somewhat altered in its nature, gives rise to what the vulgar call *grease*.

* ℞ Zinci Sulphat. Pulv. ℥ij ungt: cetacei ℥j f. ungent

New cutis is slowly formed, and appears to be so at no little expence to the animal economy, at least Nature never fails to make the old go as far as possible by extension, before the formation of new is commenced. In the cicatrization of a large wound, for example, the old skin first contracts from all sides to its utmost, in order to leave as little space as possible to be covered by new. And not only is it with difficulty formed, but its living powers are weaker when produced than the old, for, though it appears to be very vascular at first, its vessels, after a time, either shrink in calibre or, many of them, become obliterated altogether: hence it is that horses who have had exulcerated backs from saddle galls, or fistulæ, are always disposed to subsequent injury in those places, where they are commonly marked by patches of white hair. With regard to the reproduction of cutis, it has been said, that "nothing but skin can produce skin:" I am much mistaken however if I have not seen, in the human subject as well as in horses, cutis forming upon the granulations, in the very middle of a sore; which, by fresh depositions upon every side, has met and coalesced with that growing from the old, and thus considerably shortened the term of cicatrization.

Cuticle.

The cuticle, epidermis, or scarf skin, is a thin, tough, inorganic membrane, that serves as an envelope to the true skin. In the living animal it may be demonstrated by the application of a blister: serum is effused from the exhalents of the cutis, the cuticle in places is elevated by it into little hemispherical bladders, *vesicles*, or *blisters*, through the transparent sides of which the straw

color of the fluid is perfectly evident. Boiling water will destroy its adhesion to the cutis, both in the living and dead subject; in the latter, they may also be parted by putrefaction, and by long maceration.

The cuticle appears to be composed of very thin or fine flexible scales, so disposed as to bear an analogy to those of fish, which, in fact, are nothing more than their cuticular coverings: this squamous structure is best seen by viewing a piece through a glass that has been peeled off from a putrid surface; it is also very demonstrable in some stages of mange, in which the cuticle becomes hard and dry, turns white, and desquamates in successive laminæ.

The color of the cuticle is the same in all horses; whether they are black or grey, chesnut or bay: although the surface of the skin appears (when the hair is shorn off) to vary in hue with the color of the hair, the infiltration of serum from a blister underneath the cuticle shows that this appearance is deceptive.

In most parts of the body the cuticle is thickly clad with hair; but there are places, which I pointed out before, where we find it nearly or quite bare. Every part of the cutis vera is covered by cuticle; and it not only insinuates itself into the perspiratory pores and follicular passages, but lines to a considerable extent some of the outlets of the body. Cuticle passes into the mouth and pharynx, and there grows continuous with the membranes of those parts; it also enters the anus, and, some have thought, lines the whole alimentary canal; but that is not borne out by the nature of those parts; although we are not able to mark its precise line of termination, so intimately is it united with their proper linings: furthermore, it may be traced into the mea-

tus auditorius externus. Bichat indeed is of opinion that not only the cuticle, but the cutis itself lines these cavities in man. "All authors," says he, "have admitted an epidermis upon mucous membranes. But it would appear that most of them believed that only this part of the skin entered the cavities and lined them. Haller, in particular, is of this way of thinking. But a slight inspection will suffice to remark, that here, as upon the true skin, it forms but a superficial covering to the papillary surface and to the corion. Boiling water, which detaches it from the palate, tongue, and pharynx even, exposes to naked view the two other strata of skin*."

The cuticle is everywhere pierced with holes, which correspond in size, situation, and number, to those of the cutis. First, there are the pores for the hairs; secondly, the perspiratory or exhalent pores, thirdly, the absorbent or inhalent pores; and fourthly, pores of a larger size, through which unctuous secretions, in various parts, are emitted.

At one time it was believed that the cuticle was formed by the chrystallization of a fluid effused from the surface of the cutis; but the simple fact of the fœtus in utero having a cuticle is a refutation of this opinion. That it is however a deposition or secretion from the cutis, the same as the hoof is from the sensitive parts of the foot, seems not to admit of a doubt, and yet how the process of production is carried on, no one has yet been able to discover. For every practical purpose, probably it is enough for us to know, that, if from any cause the cutis vera be denuded, the

* Anatomie Générale, tom. iv. page 469.

cuticle will be speedily reproduced; from which we may conclude that its formation is neither difficult nor expensive to the animal economy. It is destitute of nerves and vessels *.

Being semi-transparent, color, as has been observed, is imparted to it by the subjacent skin; and by parity of reasoning we must account for its assumed sensibility; for, in reality, the sensation which it appears to possess is solely attributable to its adhesion to the highly sensitive cutis underneath—the animal feels through it and the hair somewhat in the manner that we do through a thin furred glove. Those parts therefore where the cuticle is thinnest, are, *cæteris paribus*, the most susceptible of impressions: the lips and nose of the horse instance this; and, in us, the extremities of the fingers, in which the *proper* sense of feeling is known to reside. That the the cuticle itself has no sensation whatever, the simple cutting of a corn in man is a sufficient proof of. Herein may be said then to consist the chief use of the cuticle—

* "It has no perceivable circulation. The exhalents and absorbents that traverse it, do not belong to it. No morbid appearance that argues organic sensibility happens in it. It does not inflame; it is passive in all cutaneous affections, and never participates of them notwithstanding its continuity. Corns (in the H. S.) and other excrescences from it, are inert, dry like it, and without vascularity: they are only painful in consequence of the pressure they give to the nerves underneath, and not of themselves. No pain is ever felt in the cuticle; it is worn by friction, like other inorganic bodies, and (like them) is afterwards reproduced."

"From all this, its life is extremely obscure; I doubt even that it really has life. I feel inclined to consider it as a semi-organic body, nay even inorganic, that nature has interposed between foreign agents and the truly organised cutis, as a medium of intercourse and gradation."—Bichat, *Anatomie Generale*, tom. iv.

to protect the cutis from immediate contact with foreign bodies or agents, and to moderate its extreme sensibility.

The cuticle does not vary a great deal in thickness in the horse, but in the human subject, in the palms and soles, its substance far exceeds that of any other part: indeed, in the latter, it is very apt to grow morbidly thick in places, the effect of external pressure, and this is the nature of what is called a *corn*—a very different disease from what has been absurdly so named in the horse's foot. The only approach to a corn that we meet with, are those horny or cuticular exuberances that grow upon the inward part of the arms, these however cannot be regarded as morbid excrescences, for they are unexceptionably present in horses, as well as in asses and in mules.

Rete Mucosum.

The *rete vel corpus mucosum* consists of a fine, delicate, laminated tissue, that is interposed between the cuticle and cutis, and regarded as their connecting medium, so that the two parts I have been describing are, in fact, nowhere in contact with each other. It is to this substance that the skin owes its color; in proof of which, as I observed but now, if either the cutis or cuticle of a black horse be examined in its detached state it will be found to be, in itself, colorless. Again, the cutis vera of the Negro is as white as that of the European; the only difference in their skins consists in the color of the corpus mucosum, which in the latter is black.

This part however is with difficulty demonstrable in a separate state from the others—we may detach it by pu-

trefaction from the cuticle, but we succeed only with great pains in stripping it from the cutis, and this is best attempted by maceration in hot water: the skin of a black horse, and a part bare of hair should be selected for the purpose. It is, as its name implies, a viscous mucilaginous matter, that clothes the delicate vessels and nerves of the cutis in their way to the surface, and appears to afford them some protection from outward impressions, and to assist in preserving their integrity of structure. It has been compared to the pigment of the eye; and, as far as their appearance is the ground of analogy, certainly not without reason.

In most animals there appears to be a general relation in color between the skin, the hair, and the eyes:—in black horses we invariably find the skin black, and the eyes dark colored; on the contrary, in the milk-white and cream-colored breeds, the skin is white or colorless, and the eyes red or ferretty. In brown, bay, and chesnut horses, the corpus mucosum participates of the color of the coat; in pieballs, skewballs, &c. it varies its hue in places with the change in color of the hair. The Negro has black hair and eyes; the Mulatto, black hair and dark eyes; the Albino (in whom by some this substance is thought to be wanting) light hair and red eyes.

This part, when destroyed, as it occasionally is by abrasion or ulceration, appears to be with difficulty regenerated, some say that it never is. We know that after broken knees, white hairs are frequently seen upon new skin; but, in the course of time, (unless the part go bare,) it is generally covered by hair of an uniform color with the coat; this inclines me to think that the corpus mucosum is reproduced. Again, new

skin in the Negro is at first red---from its blood, still the cicatrix in the course of time acquires a dark hue, and I believe, in almost every instance, ultimately takes on a black tinge.

Physiology of the Skin.

I HAVE already made several remarks relative to the economy of this part, I shall add but a few general observations.

That the skin is everywhere acutely sensitive its nervous texture would leave us no room to doubt, were we not hourly convinced of it in a variety of ways I need not particularize here; but that any part of it, I repeat, has a peculiarity in the arrangement of its papillæ, or pre-eminent tactility, resembling that which resides *only* in the points of our fingers or toes, is to me as yet unproved. GIRARD says, "qu'elle reçoit certaines impressions speciales, et devient sous ce rapport *le siege du tact et du toucher*," but he does not circumscribe either *the seat of feeling or touch* to any particular part of the skin!

Moreover, the skin is one of the principal emunctories of the body, from the surface of which passes off, as insensible perspiration, certain serous matters infiltrated through the exhalents of the cutis, which are said to depurate the circulating fluids. That something considerable is eliminated from the system through the medium of the skin, is presumed by accurately weighing an animal at different times, together with what is taken in as food, and voided as fœces or urine: a considerable loss of weight is soon detected that cannot be accounted for in any other way than by admitting that fluid has escaped from the extensive superficies of the skin.

On the Hair.

The hair is that covering which Nature has provided for the skin of animals to protect it from cold, heat, and external injury: it is to be regarded as their clothes, being in general suited in quantity and quality to the temperature of the climate they inhabit. The cutaneous surface in man, being for the most part but thinly furnished with hair, possesses a degree of sensibility, and of relation to surrounding agents, which that of a quadruped is excluded from; and in this respect, says Bichat, whose sentiments these are, life is less active in the latter. In animals, the functions of reproduction and digestion constitute the principal if not the only sources of pleasure *.

The horse is clad with hair of two qualities: the one is that fine soft material which invests the body generally, and which we expressively distinguish by the term *coat*; the other, vulgarly known as *horse-hair*, is of a coarser and stronger nature, is confined to particular parts, and appears to have been added rather for the purposes of ornament and defence than those of vesture and interception. The mane, for instance, forms a shield to the neck in combat; and for this reason, is more luxuriant in the male than in the female: it is likewise—as well as the foretop which is a continuation of it, an ornament †. The tail is not

* Anatomie Générale, tom. iv. p. 496.

† A singular variety in the production of mane presents itself in a gelding, belonging to the Artillery. From the back, posterior to the part covered by the saddle, is growing, for the space of three inches, a row of horse-hairs, precisely similar in color and quality to the mane, several of which exceed four inches in length.

only an admirable appendage, but it in some measure supplies the deficiency of hands, in switching off insects and other irritants within its reach. The tufts of hair sprouting from the fetlocks, defend those parts from contusion when they are forcibly depressed in action, and serve at the same time as a protection to the heels. The long bristly hairs standing erect from the muzzle and eyelids, are so many tangents of communication with the delicate organs of feeling into which they are implanted.

The coat itself is not of an uniform thickness or consistence in all parts. Upon the sides, the back, loins, and quarters, and upon the shoulders and arms, it is thick and abundant; but upon the inward parts of the thighs, and under the arms, it is thin and scanty. Upon the genitals, udder, and anus, around the lips, and at the entrance of the auditory canal, it is so soft and fine that it takes on the nature of down. It is longest and most luxuriant about the throttle, and within the ears; it is coarsest and most capable of resistance upon the legs. The hair, generally speaking, takes an oblique direction, either backwards or downwards, from a medium line that would cut the body into equal halves: in parts possessed of much motion—as the throttle, axilla, flank, and bend of the knee and hock, it is rough, elevated, and irregular in its course. Now and then we meet with a horse in whom the coat is everywhere frizzled or curled. More rarely, and only in certain climates, are seen horses whose skins are hairless, at least, they have no other pilous covering than a light down, which is only perceptible on close inspection *. Dogs of this description are not so uncommon.

* Mr Sewell, in the course of his visit to the continental Vete-

Whatever be the apparent nature of the hair in various animals it does not materially differ in the most remarkable circumstances connected with its structure. A hair may be said to be composed of three parts, the *bulb*, the *root*, and the *stem*. The bulb consists of a transparent membranous canal, of a cylindrical figure, perforated at either extremity, that has its origin in the adipose and cellular tissue under the skin, is received into one of the areolæ or large pores of the cutis, and terminates under the cuticle. The aperture through its base is filled by a little conical papilla, from its softness denominated the *pulp* of the hair, from which issues the root, or the tender part of the stem, which is included within the bulb: this circumstance has led anatomists to regard the stem as a secretion from the pulp. In the whiskers and bristles of large animals, nerves as well as blood-vessels have been traced into the bulb, to the latter we may assign the production of an unctuous matter that anoints the stem, and gives that sleekness and glossiness to the coat so remarkable in the Arabian horse and his race; a deficiency of which appears to be the prevailing cause of the dry and stubborn coat of a horse out of health, or of one that has suffered from exposure to cold. The stem, having emerged from the bulb, is said to receive, in piercing the epidermis, a covering from it; but, if it does so, friction soon destroys it, for

rimary Schools, met with, at that of Berlin, a preparation of "the stuffed skin of an African horse, *which had not the slightest appearance of a single hair upon it*. It is of a dun colour, and is no doubt a particular genus" he adds. In consequence of the skin being in a dried state, I suspect that the down upon it had become imperceptible, for I apprehend that the surface of it was not perfectly *bare* during life. Mr. Sewell's "*Report*."

I have not been able to obtain any distinct demonstration of this tunic. Bichat indeed denies its existence altogether. Those who have subjected large quantities of hair to chemical analysis have found its composition to be very similar to that of horn or cuticle; but it has been a matter of dispute whether the stem is formed of a single case, or whether it consists of filaments including two or more canals in their interstices: from the observations of those who have most extensively and minutely inquired into this part of comparative anatomy, it would appear that bristles and what is called horse-hair are filamentous, but that the finer hairs are simply tubular. From the summit of the pulp proceeds an elongation of soft matter into the cavity of the stem, which, from its outward resemblance to it, by many is regarded as a process or continuation of the pulp itself; but Bichat avers, that it is a distinct substance, and, though he acknowledges his ignorance of the true organization of it, maintains that it is a vital part, and that it is the seat of the coloring principle of the hair. For my own part, whatever may be the nature of this particular substance I am inclined to agree with the learned writer of the article "Hair" in Rees' *Cyclopædia*, "that the coloring matter pervades the horny tube of the hair, to which it communicates an uniform stain or dye, in the same manner as the substance of a horn or hoof is colored."

All hair has a common similarity in its structure and mode of growth, whether it assume the appearance of human hair, that of the coat or mane of the horse, the wool of the sheep, the fur of the rabbit, the bristles of the hog, or the spines of the hedge hog: its particular varieties in every one of these animals are owing to the

thickness and disposition of the fibres of its cuticular case. The coat varies in quality, color, and length in horses of various breeds: the Arabian, the racer of this country, is characterized by his smooth, silken, and glossy coat: the cart horse, the Shetland poney, and the northern horses in general, are contra-distinguished by the greater length and consequent roughness, the coarseness, and stubbornness of their hair.

With regard to color, I have already had occasion to remark, that there is some connexion between that of the skin, the hair, and the eyes: black horses have black skins and dark eyes; milk-white and cream-colored horses, light skins and *wall* eyes. The three primitive colors—those of which all the other appear to be either shades or combinations, are white, red, and black. According to RICHERAND, the lighter the shade the finer the hair; as a proof of which, he says, there are fewest black hairs in a square inch of skin, more chesnut, and most light colored. This assertion our observation appears to confirm; for it is comparatively uncommon to meet with a black thorough-bred horse, though it is a very prevalent color among cart horses; and the glossy silken coat for which the former is so much admired is in none more conspicuous than in these that are light coloured.

Most animals, I believe, at certain seasons of the year, lose one pilous covering, to have it renewed or replaced by another. The pulpy substance at the root of the hair shrinks and dries up, the stem consequently, no longer supplied with nourishment, loses its support and falls off, at the same time, a new pulp appears by the side of the old one, which during the absorption

of the latter, grows and gives root to a new hair: so that the pulp and stem only, and not the bulb, undergo the process of regeneration. The coat of the horse is shed twice during the year—in spring and autumn: a phenomenon exhibited with great regularity so long as the animal remains wild, but as soon as he is domesticated, this process is influenced by many circumstances connected with his stable management; though by none more perhaps than the temperature of the stable. That which comes under the denomination of horse-hair—the mane and tail, and the long hairs about the fetlocks, muzzle, eye-lids, &c. is never shed; hence it grows to an extreme length. One of the most striking phenomena in the natural history of quadrupeds, is, that in deer not only the hair but the horns are deciduous. In the spring, the antlers of the stag, but now so strong and formidable, become soft, and are cast off altogether, leaving him in a comparatively defenceless state; in the course of the ensuing summer, however, new horns spring up in their places, which, before the autumn has begun, crown the animal again with his noble weapons, and give him his wonted majestic mien, preparatory to the season of copulation which is now at hand. And now, his horns being fully regenerate and fit for the purposes of combat, with ungovernable sensuality he wanders forth in search of the female, whose possession, should another dispute with him, he will by terrible conflicts strive to obtain and secure.

The hair is speedily reproduced upon any denuded part; so that we are not afraid of the skin remaining bare when the *cutis vera* (and consequently the bulbs of the hair) have not been injured. Indeed hair will

be regenerated though it be plucked out by the roots. In the case of broken knees, however, it occasionally happens that the contusion of the fall is followed by more or less disorganization of the cutis, and then a scar or bare place remains; or a few light-colored or white hairs only grow upon the place, which appear to be the offspring of defective pulps.

The time of casting the coat, one that may be compared to the moulting season in birds, is often the epoch from which we may date the origin of disease, and always that when more or less debility reigns in the system. In October and November, people come to us and complain, that their hunters, whose condition they have fostered with so much pains, are weak and *foggy*, sweat under moderate exercise, are swelled in the hind legs, and are unusually sluggish and dispirited. Upon inquiry we find that the animal is changing his coat; under which circumstances, we should advise that he be temperately ridden, that his ration of corn be diminished and bran mashes substituted, and that he be clothed warm in order to promote the growth of the new coat: a little alterative medicine* may also be of service in rectifying the digestive functions.

On the other hand, the appearance of the hair may be adduced as a sign of internal derangement: such a horse is "unhealthy in his coat" is an expression in the mouth of every stableman; and he generally has recourse to a remedy which restores its smooth and healthy aspect, without knowing at all the connexion between the one and the other. The fact is, that this is one of the most remarkable instances we have of the

* Vide Note, page 77, Part I.

sympathy existing between the skin and the alimentary canal; and that we might *ad infinitum* bestow our labor upon the former without effect unless we were at the same time to direct our attention to the latter. Here, a dose of physic, or what is better, some laxative medicine, in conjunction with a soft diet, is required to render the curry-comb and brush availing in redressing and polishing the coat.

But there are other causes that may give rise to a rough coat. Simply taking a horse into an atmosphere colder than the one he has been habitually exposed to, will make the hair stare; even leaving the stable door open to a current of air will do it, which the advocate for a warm stable is no stranger to. Now, this can be no other than the effect of contraction, not of the skin itself, but of the muscular fibres which adhere to it---the panniculus carnosus, in truth, it is something similar to what happens in the erection of the bristles, though that is a voluntary act, while this is not at all times dependant on the will: in the one case, cold is the stimulus to contraction; in the other, volition.

What I have just particularized are not to be confounded with that variety of rough coat which a horse acquires during the winter season at grass; for this consists in an increased growth of hair; and hence it is, a fact well known, that a hunter stabled with a long staring coat in the autumn, cannot be made to look smooth and sleek, by any subsequent treatment, until the ensuing spring. One of the best elucidations of this is the hairy covering of the ass. when we remark the different appearances which that puts on in summer and in winter, we may with truth say, that this animal has a coat suited to the seasons

Now and then indeed, from some cause or other, the action of the cutaneous vessels being disordered and the shedding process arrested or but imperfectly performed, the old coat, or some parts of it, remain on until the second time of casting: when this is the case, the hair is said to be *set*.

Having proceeded so far in this interesting subject, I shall conclude the lecture with a few observations on the nature of a "good coat," and the means of producing and preserving one. When the hair lies smoothly and intimately upon the surface of the skin, when it has a soft kindly feel, and a bright shining hue, it is said to be a *good* coat. Now, that we may more clearly trace out the causes to which this is owing, let us first take a view of the circumstances under which it is produced. Horses that are natives of hot climates are in general light coloured, and have all soft, sleek, and fine coats: in a late communication from a resident in Barbadoes, I find this passage—"the horses (which are chiefly from Spain and America) are in the finest condition imaginable: *you may almost see to shave from the gloss upon their coats.*" From which indeed another fact, provable by innumerable other instances, receives confirmation: *viz.* that an animal will vary the length and quality of his coat according to the temperature of the climate into which he is transplanted; indeed some have gone so far as to say, that the different breeds of horses are referable to such a change of circumstances. Let this be as it may, we have ample evidence at home of the truth of the first of these positions: every horseman in this country knows too well the change that is to be wrought in the coat of his horse by warm clothing to need more than the bare mention of it here, as con-

firmatory of this point. Heat, then, is absolutely and indispensably necessary to the production of a fine coat: cleanliness, friction, and attention to the general health—all comprised in *good grooming* contribute to this condition of the hair; but the principal, the essential agent is heat, either generated by warm clothing, or conveyed by natural or artificial temperature. To explain the operation of heat upon the skin and coat—it must in the first instance determine an unusual flow of blood to it, and probably *increase* the circulation of the cutaneous system, the natural consequences of which are, an augmentation of its secretions, among others, of the perspirable fluid, and of the unctuous or oleaginous matter that pervades the hair: this gives a renewed suppleness to the skin, and a kindly feel and gloss to the coat. Now, it appears to me, that, of a coat formed under such an influence, the quality will be sensibly altered from what it was when exposed to cold; at the same time, the curry-comb, by greatly irritating the skin, must promote this fresh action in it, and, by removing dirt and dandriff from its pores, open any that may be obstructed, and so liberate still more perspired fluid: which even of itself is daily had practical recourse to, as a depuratory to the skin, for the production of a good coat, in the sweating of horses for the turf and field. Without the agency of heat then, it is absolute nonsense to talk of making horses "look well in their coats." Let me not, however, in making this assertion be understood to be an advocate for a *hot* stable; on the contrary, I have ever to the extent of my power inculcated ventilation, which I have always found to be compatible with as much warmth to the skin as was necessary to the production and preservation of a fine coat.

I must here cut short this interesting investigation, already extended beyond the limits of this lecture. I hope, at another time, to have it in my power to pursue it *.

* There is so little information afloat on this subject, that it behoves us "to gather honey wherever it is proffered." A writer in the Sporting Magazine of May last, after asserting that a *fine coat* is necessary to *condition*—where, in my humble opinion, he has put effect for causation—and informing us that horses vary much in this particular, for which there is, says he, "*no ostensible reason*," concludes with the following pertinent communication

The Marquis of Hastings, while Governor General of India, "being impressed with an idea that geldings would be more efficient in our Indian cavalry, caused two troops to be formed in each regiment;"—"when it was unanimously decided that geldings were very far inferior, and this particularly in cold weather, when their coats were long and rough. In furtherance of this experiment, many horses were castrated, and it was observed, that all those that were operated on immediately previous to the commencement of the cold weather, *were afterwards, in winter, always long coated*, whereas those which were castrated at the commencement of the hot season, *kept nearly as fine coats during the cold as the entire horses*." When we come to learn what an influence the generative organs of the male have in the system, and how much the production of hair in particular is affected by their functions, we shall not be surprised at the disturbance which castration appears here to have created in the shedding process.

LECTURE XXXIII.

On the Nose.

THE nose, for the convenience of description, may be divided into its *hard* parts, or those that compose its exterior, and give shape and stability to it, and its *soft* parts, or such as enter more especially into the composition of the organ of smell. The hard parts consist of bones and cartilages: of the former I have already shewn the situation, connexion, &c. it now remains for me therefore to give the anatomy of the latter.

The cartilages of the nose are five in number:—one internally and centrically situated, divides it into two parts or *chambers;* the other four, placed externally and inferiorly, enter into the composition of the nostrils. The first, named the *septum narium vel nasi*, is maintained in its place chiefly by the vomer, within the groove of which its posterior edge is firmly fixed, superiorly it is attached to the nasal plate of the os ethmoides, and anteriorly to the ossa nasi, along the nasal suture. The remaining four cartilages are fixed around the upper and inner part of the nostrils, two of them broad are placed superiorly two narrow and curvated outwards, below them, they are attached to, and sup-

ported by, the extremities of the ossa nasi and the septum narium. These four cartilages serve to give shape and substance to the nostrils, to keep them constantly open, to admit of occasional dilatation of them, and to defend the taper extremities of the ossa nasi from injury and fracture, to which they would otherwise have been continually exposed.

The internal parts of the nose, in the horse and dog, are developed in a more determinate form, and on a much larger scale, comparatively speaking, than in man; hence the acuteness of smell in these animals, which to them appears to supply the place of that sense of touch which we so eminently possess. The cavity of the nose, I said, was divided into two chambers by the septum, that have no direct communication with each other; and each chamber is subdivided by the ossa turbinata, which form but imperfect partitions, into three passages, called *meatus;* but which, in reality, are nothing more than so many longitudinal canals. Every part of the chamber is lined by a dense, soft material, of a pale red colour during life, denominated the *pituitary* or *schneiderian membrane;* which, within the nostrils is continuous with the reflected integuments, and superiorly, where the chambers open opposite to the pharynx, with the membrane of that part: it also passes into and lines the sinuses of the head, though there it puts on a less vascular aspect. For, as I shewed in describing the bones, all the sinuses—the frontal, the nasal, the maxillary, the sphenoidal, and the ethmoidal, open by distinct apertures into the chamber of the nose; so that the extent of surface of the schneiderian membrane, more particularly if we take into our view the large size of the turbinator bones, which it also envelopes, is

very considerable, and to this is chiefly to be attributed that exquisite perception of odor which horses and dogs are known to possess. This membrane has a very close and firm adherence to the parts it covers by the insinuation of its fibres into them, indeed the very basis of its structure is fibrous, with which is mingled a large proportion of cellular substance, as a substratum and medium of connexion for its glands, vessels, and nerves: the inner surface of it appears to supply the place of periosteum and perichondrium, the outer is more compact, is smooth and papillary, is everywhere pierced by exhalents, from which distils a limpid fluid, and is strewed with numerous mucous follicles, whose secretion, by preserving its surface constantly moist, sheathes and defends it from acrimonious inhalations, and preserves its nice susceptibility of impression. It is well supplied with blood-vessels, which are less numerous and smaller where it lines the sinuses, and receives sensibility from two sets of nerves, whose ramifications are abundantly distributed to every part of it: one set furnish it with ordinary feeling, the other, having its tender *ramusculi* interwoven in its papillæ, endow them with the faculty of smelling.

There are two ducts, that must not be overlooked, connected with this organ. The *ductus ad nasum*, a tube partly bony and partly membranous, which commences at the inner *canthus* of the eye, within the os unguis, runs along a canal in the os maxillare superius, and terminates at the inner and inferior part of the chamber of the nose, upon the common integument, about one-fourth of an inch from its junction with the pituitary membrane. the orifice of it is generally large enough to admit a crow's quill. The second is the *ductus communis narium*,

which takes its course into the pharynx, under the vomer, where it is formed by the union of two branches that arise from oblong orifices in the floor of the nostrils.

This organ in the horse has two remarkable appendices—two little pouches, or *culs-de-sac*, above the external nares, known by the appellation of the *false nostrils*. They are composed of doublings of the common integuments, but, except at their entrance, are without hair. They freely communicate with the chamber of the nose, and open externally, in common with them, through the nostrils. Their use has not been discovered.

Within the cavity of the nose cognizance is taken of those subtile effluvia—those odoriferous and inconceivably minute particles which are conveyed into it through the medium of the external air. To the exquisite perceptivity of the schneiderian membrane, the organ of smell, do animals owe those delicate and delightful impressions which enable them to pursue their prey, or to ascertain the properties of such substances as are provided them for food: this it is that capacitates the dog to follow the footsteps of his master, or pursue the course of the swift-footed deer—to seek out the haunts of game, or retrace his pad in an unknown country. It is remarked in all quick-scented animals, that the sinuses of the head are very capacious, and the ossa turbinata large and prominent; though it seems that the membrane lining them does not possess so many olfactory nerves as that spread over the chambers of the nose, and consequently not an equal acuteness of smell. There cannot be a doubt however, that the sinuses do contribute very much to this faculty, and it is generally thought that they do so, by retaining the scented air for a much longer time than it could possibly have remained within the nose itself.

The openings into this organ, both inferior and superior, are of large size, to admit of the free passage of air to and from the lungs. That peculiar intonation, *neighing*, the voice of the horse, is produced by the forcible expulsion of air through the larynx into the chambers of the nose, where it is modulated by the various impediments it meets with and the quivering action of the external nares.

On the Larynx.

The larynx, placed at the top of the windpipe, between it and the root of the tongue, is that organ through which the animal breathes, and produces that well-known sound called neighing. Before I proceed to examine the larynx, I shall make a few remarks on the anatomy of the os hyoides; a bone I postponed the description of in a former lecture in consequence of its being more immediately connected with the parts now before us.

The *os hyoides* is a bone of a very irregular figure, placed between the root of the tongue and top of the larynx. It has been divided into three parts:—the *body*, *appendices*, and *cornua*. The body, remarkable enough, has the precise configuration of a common spur, of which the semi-annular part is fixed around the upper margin of the larynx, while the neck projects forward in the throat, where it serves for the attachment of the root of the tongue. To the posterior, round, cartilaginous ends of the body, are fitted, by smooth cartilaginous cups, the appendices—two processes, about three inches in length, which take a direction upward and forward: their union is effected by means of strong capsular ligaments with synovial linings; and the appendices themselves furnish a place of origin to certain

muscles belonging to the tongue. The cornua begin from the tops of the appendices, with which they have an articular connexion similar to what exists between the appendices and the body, embrace the sides of the pharynx, to which they give extensive attachment and support, proceed along the branches of the jaws, and are fixed by ligaments to the petrous portions of the ossa temporum.

By the os hyoides then it is, that the larynx is retained in its place, at the same time that a certain degree of motion is admitted between them, consequent upon the performance of deglutition and the production of voice. Regarding it *in situ*, the larynx appears to be entirely muscular; for it is not only clothed with its own muscles, but receives a covering, upon the sides and upper and posterior parts, from the constrictors of the pharynx; and we must divest it of both these coverings in order to lay bare the cartilages, which we must acquire a knowledge of before we can understand the attachment and uses of the muscles. These cartilages are five in number:—the *thyroid*, *cricoid*, two *arytenoid*, and the *epiglottis*.

The thyroid or shield-like cartilage, by much the largest of the five, forms the superior, anterior, and lateral parts of the larynx. It consists of two broad lateral portions, continuous and prominent at the upper and anterior part of the neck, the prominence corresponding to which in human anatomy has received the name of *pomum Adami*. Below this point of union the divisions recede from each other, and leave a triangular space between them, which is occupied by a ligament named the *ligamentum crico-thyroideum*. The four projecting corners from the posterior part of the thyroid cartilage

are named its *cornua*: the two superior are joined by capsular articulations to the body of the os hyoides, the two inferior are connected by very short capsular ligaments to the cricoid cartilages; and the union of all these parts receives additional strength from expansions of membrane. At the roots of the superior cornua are two foramina that give passage to nerves, of considerable importance, to the interior of the larynx. This cartilage not only composes the chief part of the larynx; but, as its name indicates, incloses and shields from external injury all the others.

The cricoid or ring-like cartilage is placed below the thyroid; but the broadest part of it is behind, where it overlaps the first ring of the windpipe somewhat in the form of a helmet; from which indeed in front, in consequence of having become narrow, it is only distinguishable by its situation. Upon its broad or posterior part are four surfaces of articulation:—the two upper receive the hinder extremities of the arytenoid cartilages, the two lower are adapted to the inferior cornua of the thyroid cartilage: they are all furnished with capsular ligaments and synovial membranes. Moreover, it is attached by ligamentous expansions to those parts, and to the first ring of the trachea.

The two arytenoid or ewer-shaped cartilages, of triangular figures, lie over the upper and back part of the windpipe, leaving an aperture between them leading into that canal, denominated from its proximity to the tongue, the *glottis*. Their inward parts are everted, and form a triangular prominent border over which is spread *the membrane of the glottis;* their outward surfaces are marked by concavities in which are lodged the arytenoid muscles. They repose upon the cricoid cartilage be-

hind, with which they have capsular articulations; and in front have a membranous connexion with the cartilage next to be noticed.

The epiglottis, so named from being raised over the glottis and occasionally covering it like the lid of a pot, is well adapted from its heart-like shape to the *rima glottidis*; whose margin is now completed by two narrow slips of cartilage that proceed from the base of the lid to the arytenoid. By some, these cartilages have been separately considered; but in my opinion improperly so; for they are, in truth, nothing more than prolongations or appendices of the epiglottis. The laryngeal face of this cartilage is smooth and concave, and covered by an extension of membrane from the glottis; that part opposed to the tongue is unevenly convex, and is tied to that organ, as well as to the os hyoides, by a doubling of membrane infolding some muscular fibres: to this musculo-membranous ligature, which assists in retaining the cartilage in its elevated position, unless when it is momentarily pressed down in the act of deglutition, and in subsequently raising it again into its place, the name of *frænum epiglottidis* is properly given. The frænum receives co-operation in this function from strong elastic ligaments that connect the base of the epiglottis to the thyroid and arytenoid cartilages.

If we detach the epiglottis, or raise it forcibly in order to obtain a more complete view of the rima glottidis, the latter will be found to be stretched into an oblong quadrilateral figure, whose width gradually diminishes from the middle towards either extremity, and bears a ratio of about one to six when compared to its length. The sides, turned forwards, are formed by the arytenoid cartilages; those directed backwards, by two prominent

folds of membrane, (which envelope the thyro-arytenoid muscles,) commonly described as the *vocal ligaments*, from their being concerned in the formation and intonation of the voice. Immediately above each of them is a slit-like aperture, opening into a membranous sac large enough to contain a walnut: this is one of the *ventricles of the larynx*, whose use is also connected with the production and modulation of the voice.

The membrane lining the cavity of the larynx is one of great susceptability; on which account it is kept continually moist by a mucus, oozing from numerous lacunæ—the excretory orifices of small subjacent follicles whose situation is denoted by the little round eminences upon its surface. This is the common seat of the catarrh that is accompanied with cough.

The Muscles of the Larynx

ARE eight pairs and a single one.

THYRO-HYOIDEUS arises from the semi-annular portion of the os hyoides, passes downwards and backwards, decreasing in breadth in its descent, and is inserted into a little eminence upon the side of the thyroid cartilage.

It will elevate this cartilage, and with it the whole larynx; or it will depress the os hyoides.

CRICO-THYROIDEUS. A small muscle of a triangular figure placed below the former. It passes from the side and front of the cricoid cartilage to the under border of the thyroid—lying in the space between them.

It has the power, in action, of approximating these parts.

Crico-Arytenoideus Posticus has an extensive fleshy origin from the broad part of the cricoid cartilage, grows narrow in its ascent, and implants itself by fleshy and tendinous fibres into the posterior part of the arytenoid.

To pull the arytenoid cartilage backward.

Crico-Arytenoideus Lateralis is concealed from view by the inferior cornu of the thyroid cartilage. It arises from the upper border of the cricoid cartilage along its side, and terminates in the posterior extremity of the arytenoid, below the place of insertion of the foregoing muscle.

This muscle, in action, will dilate the glottis, by separating the arytenoid cartilages.

Thyro-Arytenoideus is the largest of the arytenoid muscles. It lies between the thyroid cartilage and membrane of the larynx, and adheres to both of them. It proceeds from these broad attachments to the inward part of the thyroid cartilage and the triangular ligament in front of it, (where it is divisible into two portions,) and is extensively inserted along the side of the arytenoid cartilage.

It will enlarge the glottis by separating the arytenoid cartilages, and tighten the membrane it adheres to in its course.

Arytenoideus. A small muscle that runs from the posterior part of one arytenoid cartilage to the corresponding part of the other.

It will contract the glottis by approximating these cartilages.

Arytæno-Epiglottideus. A small muscle taking its course from the arytenoid cartilage to the epiglottis.

To shut the glottis by depressing the *lid*.

Thyro-Epiglottideus. A slender muscle that runs from the thyroid cartilage to the epiglottis

It will assist the former.

Hyo-Epiglottideus. This, the *single* muscle of the larynx, lies embedded in fat and a doubling of membrane at the root of the epiglottis, between it and the body of the os hyoides. It takes its origin from the spur-like portion of that bone, and is fixed to the broad part of the epiglottis.

This muscle is not placed here to maintain the elevated position of the epiglottis, its own elasticity being fully adequate to that; but it will still further retract that cartilage, and thus considerably enlarge the opening of the glottis It does this more effectually, and to a much greater extent, when those muscles co-operate that draw the arytenoid cartilages from each other.

On the Trachea.

The *trachea*, or windpipe, is that cartilaginous tube which extends along the neck, from the larynx to the lungs, for the conveyance of air. In horses of the ordinary size it is from twenty-five to thirty inches in length.

The trachea commences from the inferior border of the cricoid cartilage, opposite to the body and transverse processes of the atlas, takes its course along the anterior and inferior part of the neck between the sterno-mylodei muscles, (which by their approximation conceal the lower portion of it,) and enters the chest between the two first ribs, where, beneath the curvature of the posterior aorta, it divides into two parts, named the *bronchiæ*.

From fifty to sixty annular pieces of cartilage enter into the composition of the windpipe, which constitute a structure so remarkable for the inequality or asperity of its exterior, that the ancients, in order to at once distinguish it from all other vessels, called it the *aspera arteria*. No entire or undivided tubular substance could have partaken of the various motions of the head and neck without having suffered more or less distortion, and consequent deformity and diminution, of some part of its canal, which would have been attended with frequent interruptions, dangerous and even fatal, to the respiratory functions; whereas, constructed as it is, with the aid of its muscular power, no attitude in which the animal may naturally put himself, will impede the passage of air through it. The cartilages, or, as they are commonly described, the *rings* of the windpipe, have all a close resemblance to one another: if there be any disparity between them worthy of notice, it consists in those that form the superior part of the pipe being somewhat larger and broader than those nearest to the bronchiæ *. A ring is not uniform in its breadth, in consequence of having waving or scolloped borders; the advantage of which is, that a sort of dove-tailed connexion is effected which materially contributes to the compactness and strength of the entire structure. Its front and sides measure, in the broadest places, half an inch in breadth, and nearly a quarter of an inch in thickness—evidently made so substantial to resist external injury; whereas its posterior or unexposed parts grow

* Now and then we find, at the upper part of the tube, two or three or more of these rings accreted together: it gives rise to some prominence thereabouts generally, and may be perceived by taction in the living animal.

suddenly thin and yielding, and taper to the extremities; which, instead of meeting and uniting, pass one over the other, and thus form a shield of defence behind, while they admit of a certain dilatation and contraction of the tube: here a ligamentous expansion, mingled with cellular membrane, unites and so invests these attenuated terminations of the cartilages that we are unable to make out their ultimate disposition until this substance has been cleared away by the knife. The rings are attached to one another by narrow ligamentary bands, strong and elastic, which, after the rings have been drawn apart in certain positions of the head and neck, have the power to approximate them: when the pipe is removed from the body and suspended by the uppermost ring, these ligaments counteract the tendency which its weight has to separate the rings, and still maintain them in apposition. The lowermost ten or twelve pieces of cartilage appear on examination but ill to deserve the name of rings; indeed they are little more than semi-annular, the deficiency behind in each of them being made up by an intermediate moveable portion of cartilage, whose breadth increases as we descend, which is let into the vacuity, so as to overlap the terminations of the segments, where it is confined and concealed by the ligamentary and cellular investment before noticed.

Where the outward extremity of the ring suddenly turns inward and degenerates into a thin flexible flap on either side, a band of muscular fibres is fixed and stretched across the canal, which divides it into two unequal semi-elliptical passages,—the anterior one is the proper air-tube, the posterior or smaller one is filled with a fine reticular membrane that connects

this band to the posterior part of the ring, and keeps it, in action, from encroaching upon the main conduit. This self-acting band appears to me to have been added to the tube to enable it to enlarge its calibre—not to diminish it, as a superficial view of these parts might lead one to imagine; for in consequence of the passage being naturally elliptical, and the muscle being extended across its long diameter, the contraction of its sides will give the tube a circular figure, by increasing the curvature of the ring anteriorly, and thereby, in effect, will expand and not contract the canal. I would say, then, that the trachea was made muscular in order that it might have the power of increasing its capacity for the passage of air, whenever the lungs were called into extraordinary action: in addition to which, I think, that this band, in some degree, may counteract any tendency that certain positions of the head and neck have to alter its shape and diminish its calibre. This opinion is corroborated by the circumstance, that the muscle grows slender and pale as we approach the lower end of the pipe, where the canal itself is nearly circular, and where it is placed in the least moveable part of the neck *.

The trachea is lined by a soft, pale red membrane, which anteriorly has a close adhesion to the rings themselves, and presents a smooth polished internal surface; but which posteriorly is loosely attached to the muscular band, and puckered into fourteen or fifteen longitudinal *plicæ* or folds, that extend with regularity

* In the physiology of this part, I find I am at variance with Girard. The French professor ascribes to it the power of *contracting the calibre* of the trachea. "Cette couche, bien evidemment musculeuse, peut retrecir le calibre de la trachee, en rapportant les extremites des segmens." *Anat. Vet.* p. 116 et 117. tom. II.

from one end of the tube to the other. These folds were evidently made to allow of the contraction and elongation of this muscular band; for I cannot myself assign any reason why they should exist in its relaxed state, unless this fulness of membrane be given to admit of enlargement of the calibre of the tube during the contractions of that muscle: if this be plausible, I may adduce the corrugation of the membrane as another proof that the calibre of the trachea is susceptible of augmentation. This membrane is continuous with that which clothes the rima glottidis, but it is paler than it, and not near so sensitive. Its arterial ramifications, which are also less abundantly distributed over it, exhale a vapor from its surface; independantly of which, it is kept continually lubricated by mucus, furnished from its numerous *lacunæ*, which defends it from any thing acrimonious that may be contained in the breath.

The trachea having entered the thorax bifurcates into the two *bronchiæ*—of them, the right is the more capacious tube, from having communication with the larger division of the lungs; the left the longer one, in consequence of having to cross under the posterior aorta, in its course to the left division of the lungs. The last cartilage of the main pipe has a spear-like or angular projection extending down between the bronchiæ, which fills up that space that would otherwise be left open from the divergent manner in which they branch off. it is very moveably attached in order that these tubes may accommodate themselves to the motions of the neighbouring parts. The bronchiæ vary in structure from the trunk that gives origin to them: instead of their rings being formed of entire pieces of cartilage, they are constituted of several portions, making up so many segments of the

circle, that overlap one another, and are united together and invested by an elastic cellular substance: they also differ in having no muscular band, another fact connected with the physiology of that part. The bronchiæ in penetrating the substance of the lungs subdivide—the right into three principal branches, the left into two; from which spring innumerable others that grow smaller and smaller, until ramifications so minute are produced that they are not traceable by the naked eye. In the larger branches we may dissect out five and even six segments of cartilage, which are held together by a thin, but dense and elastic cellular substance; in the smaller divisions, only two are found, and they are diminished in size; and in the smallest visible ramifications of all, cartilage is altogether wanting, though, in many places, marks of the rings may be seen upon the continuation of the lining membrane, which here composes the entire parietes of the tube. In the larger branches this membrane, which is continuous all the way through the bronchial system, assumes a plicated disposition—apparently, to admit the more readily of distention.

Thyroid Glands.

Two egg-shaped, apparently glandular bodies, attached just below the larynx to the sides of the windpipe, and united in front of it by an intervening portion of the same substance, which, by way of distinction, is by some called the *isthmus*. They are enveloped and retained in their situation by cellular membrane, are larger and more vascular in the young than in the old subject, and exhibit a spongy texture when cut into, which I am at present ignorant of the precise nature of. They

are well supplied with blood-vessels, and have many small nerves going to them. Their physiology still remains obscure.

Diseases of the Air Passages.

In this stage of inquiry, I shall confine my observations to the two common morbid affections of these parts:—catarrh and roaring.

On Catarrh.

A CATARRH, in common language *a cold*, may be said to consist in a defluxion of mucus, or of mucus mixed with pus, from both nostrils, which is generally attended with glandular tumor, and often with cough and more or less febrile action.

I have stated, that the membranous lining of the air passages is kept continually moist by a sero-mucous secretion, of which, I may here remark, in a perfectly sound condition of the part, more is not produced than is required for that purpose; and so rarely is mucus discharged from the nose without some present or previous inflammation of the membrane, that its emission is generally regarded (and probably this is as good a line between health and disease as can be drawn) as symptomatic of unsoundness. There is a thin, aqueous distillation from the nostrils occasionally to be seen in health, especially after exertion, but this is mostly derived from the lachrymal duct, and there may be a flake or two of pure white mucus apparent, lodged just within the ala of the nostril, but this is also *occasional*: were it continually succeeded, after having been removed, by a similar appearance, whether the schneiderian mem-

brane were apparently inflamed or not, I should unhesitatingly pronounce the organ to be unsound.

I think that the nature and symptoms of catarrh will be best understood by describing it under three stages. In the first or incipient stage, an acrid watery secretion trickles from the nose, mingled with some white flaky mucus, which is commonly accompanied with reddening of the schneiderian membrane, and tumor of the submaxillary glands: cough is rarely produced thus early. In the second stage, which succeeds the first generally in the course of three or four days, the watery fluxion has ceased, the mucous become copious and thick, and often yellowish from the admixture of pus, the membrane is deeply and generally reddened and is very irritable, the submaxillary tumor is prominent and tender, and a loose and sonorous cough is occasionally heard. And now a mild fever generally comes on:—the animal appears unusually dull and heavy, he moves sluggishly, his head is not carried with his ordinary animation, or he may hang it and let his eyelids droop, his appetite is commonly impaired, his pulse is about 55° or 60', and his body is disposed to be costive. In addition to these, there are other symptoms which, from being present only in certain cases, may be regarded as *occasional*. Soreness of the throat may be a prevailing symptom; and when it is, the animal, from experiencing pain in the act of swallowing, refuses to eat or to drink much, and gentle compression of the gullet will make him instantly flinch and will excite violent coughing. One or both of the parotid glands may tumefy and grow tender to the touch; and these swellings, if they show a disposition to continue swollen, often terminate in abscess. Now and then, when the fever runs

high, the respiration becomes disturbed, the pulse rises, the superficies of the body grows cold, or feels very hot, and the animal is evidently laboring under constitutional derangement: in such cases, the chest is very apt to become the chief seat of disease, by *metastasis*, or, as I believe, through the intervention of the windpipe. Though this is the ordinary course of the disease, variations are always to be met with; but as they are all related in their general character, they need not particularization *. I shall reserve to the conclusion of this lecture what I have to say about the third or chronic stage.

In the primary stage, the inflammatory action appears to be confined to the pituitary membrane; as soon as it pervades the membrane of the glottis, it is manifested by cough or symptoms of sore throat, or by both: if it extend down the windpipe, purulent matter is generally discharged from the mouth, as well as from the nose, in the act of coughing, and it often runs, without any expulsory effort, profusely from the latter when the head is made the dependant part.

Touching the theory of catarrh, the production of the undue quantity of the natural sero-mucous secretion of schneider's membrane, is attributable to an augmentation in the supply of blood to it; the purulent commixture, to some unknown variation or alteration in the action of its supplying vessels. The thickened state of the membrane, (not commonly perceptible until the disease is advanced in the second stage,) by which we explain the dyspnœa occasionally present, is owing to

* Horses are seldom shown to us before the commencement of the second stage: in some, the primary stage is altogether wanting

this plethora of the vessels, and to interstitial effusion, a mode they have of relieving themselves of distention; and the cough results from the preter-natural excitability of the membrane, and more particularly of that part of it which covers the rima glottidis.

Those of the present day who maintain that the exciting cause of catarrh is a suppression of that blood which ought to have passed off in the form of cutaneous evaporation, and the consequent repulse of it upon the membranes of the respiratory passages, must not seek for confirmation, or exemplification of their theory among horses, as the following notorious facts will show:—Two undomesticated horses out of three, under five years of age, that are taken from cold situations and kept in warm stables, and fed upon the ordinary ration of provender, will receive catarrh. Whereas, if the same animals, after having recovered, and become naturalized to their warm abode and new habits of life, be, under similar circumstances, exposed as formerly, whatever other disease the sudden vicissitude of temperature may be productive of, the probability is that not one, (even though there were fifty of them,) will *catch cold*. But, even domesticated horses, that are advanced in years, and that have been accustomed to such changes, do not always escape, unless some precautionary measures be taken; for hunters, when they are taken up from grass in August and September, in cold seasons, unless due attention be paid to the temperature of the stable, and their clothing and regimen, are often the subjects of catarrhal attacks. Now and then this disease follows violent exercise, and it is most likely to do so at a time when the horse is

not in adequate condition and wind. The practice of allowing sweating horses to stand long in exposed situations in cold weather, while the rider is regaling himself or performing his business within doors, and then of suddenly renewing their suppressed perspiration, one would say *primâ facie* must be hurtful in the extreme, and yet we daily see the animal obnoxious to the most trying changes of this description (and I am really astonished how his constitution bears up against then pernicious tendency) with apparent unaffectedness.

I have heard veterinary surgeons talk of *influenza*, and (though rather unlearnedly) of *epidemic* catarrh among horses. Catarrhal affections, as well as pneumonic, are almost always prevalent among young horses from November to March, or April; and are generally more or less so according to the rigor of the season; they also, in some years, attack great numbers of horses about the same time, when the weather has been unseasonably cold, remarkably changeable, or on a sudden has become sultry: in fact, by noticing the vicissitudes of the weather, and attending to the circumstances of locality, under the influence of which the disease has been engendered, we may often very rationally account for its origin; but if we give up our minds to assigning the cause to that about the nature of which we are as ignorant as we are destitute of proofs or foundation for such an assertion, we shall bewilder ourselves, and mislead them who look up to us for instruction.

The treatment of catarrh is very simple. If there be no concomitant febrile action, or but little, the confinement of the horse for a few days in a stable of a mean

and uniform temperature *, (with attention to the cleanliness of it,) warmly clothed, and fed with bran mashes in lieu of corn, with the aid of a few doses of laxative and diuretic medicine †, will restore him to health: at the same time, if there be much submaxillary tumor, or any cough, or soreness of the throat, an ounce or more of the *infusum lyttæ* should be rubbed either under the jaw, or about the throttle. If the horse purge after having taken a few of these balls, let them be remitted for three or four days, and afterwards administered but once in the course of twenty-four hours. But, should febrile irritation manifest itself in the system, from two to four quarts of blood may be detracted, according to its activity, and either, what I call, the *sedative* ball ‡ exhibited, or hellebore in combination with aloes §. Many practitioners are in the habit of bleeding, almost invariably, in catarrh. Although there is nothing directly injurious in the practice, still it is often uncalled for; when there is much reddening of the membrane, with but little discharge, and a dry hard cough, I am an advocate for venesection. There is certainly one advantage in bleeding early, which is, that it is seldom necessary to bleed again. The blister, in most cases, ought to be repeated about once or twice a week.

* About 50° of Farenheit.

† ℞ Aloes Vulg. Ext. ʒß.
Hydrarg. Submuriat. grs. x.
Resinæ Flavæ ʒij.
Saponis Mollis q. s. ut. ft. Bol. semel vel bis die sumendus.

‡ Vide Note, page 79, Lecture v. Part I.

§ ℞ Rad. Veratri Pulv. gr. x. ad ℈j.
Aloes Vulg. Ext. ℈j.
Resinæ Flavæ ʒj.
Saponis Mollis q. s. ut. ft. Bol. bis terve die sumendus.

The duration of the acute or inflammatory symptoms of catarrh, even if the disease be allowed to take its course, will seldom exceed ten days or a fortnight; but, then, it is very apt to run into the chronic or *third* stage, more especially if the case have been neglected, and this may prove tedious, and sometimes difficult to get rid of. The animal feeds well, is in good spirits, and appears to enjoy health, and yet a copious efflux of thick, white, and perhaps grumous matter, shows itself at the nostrils, now and then only at one of them, which nothing we can employ, either locally or generally, seems to have any influence on: this gleety condition of the membrane is every now and then followed by unequivocal symptoms of glanders. The remedies I generally have recourse to here, are—some tonic drench *, occasional doses of laxative medicine, a rowel under the jaw, or (what Mr. SELWELL recommends) setons along the face, two or three feeds of beans in the course of the day as a substitute for corn, and moderate exercise in the open air. Fumigation with the muriatic, nitric, or oxy-muriatic gases, I have seen occasionally useful. In cases in which cough and tenderness about the throttle have been connected with the gleet, I have experienced good effects from the application of a blister along the course of the windpipe, from the jaw nearly to the sternum, and its repetition once a week: here the fumigation is inadmissible.

* ℞ Ferri Sulphatis ℥ß. ad ℥j.
Infusi Sem. Lini ℔ij. Solve et ft. Haust. dandus semel vel bis die.

LECTURE XXXIV.

On Roaring.

ROARING may be defined to be, a peculiar unnatural sound made in respiration.

To one whose ears are familiar to this sound, any attempt to describe it may appear supererogatory; and to one who is unacquainted with it, no description can convey just notions of all the variations of it that occur in practice. We are not only told of *roarers*, but we hear of *pipers*, *wheezers*, *whistlers*, *high-blowers*, and *grunters*: a cant in common use among our horse-dealers and horse-men, of the vulgar meaning of which no professional man should show ignorance. And though their cases are often confounded in practice, and not seldom, I believe, are dispatched without any discriminative investigation at all, still the Veterinary Surgeon ought to be prepared to encounter these monsters at all points; and therefore, I shall venture on an outline of the character of each of them, in relation to the degree and peculiarity of the sound, though I am apprehensive I shall but faintly trace those nice points of distinction which the appellations themselves appear to demand.

Pipers. I shall take the liberty to dismiss altogether from this description, for they do not, strictly speaking, belong to the genus of roarers: the word is only admitted here by way of contrast, and I have satisfactorily traced its popular import to broken wind.

The *wheezer* is admitted to be a species of roarer; but his disease, I am very much inclined to think, is seated in the lungs; the wheezing noise he makes, very like that emitted by the human asthmatic, differs from the sonorous respirations of other roarers in this—that it is a common attendant on rest, and consequently may be often heard in the stable: in all cases, it is distinctly audible as soon as the animal is walked or trotted out.

With the *whistler*'s note we soon become acquainted. Whoever has listened to "the northern blast rushing through a crack in the window-shutter," need seek no description of it. In this instance, the sibilation appears to be produced by a continued rush of air through some narrow pass in the trachea or larynx; it is seldom or never heard, therefore, in a state of quietude, nor is the common practical test of roaring infallible here: when suspicions are awakened of its existence, I know of no means so likely to compel the animal to disclose this imperfection as a pressing gallop up hill. One well-marked instance of this variety of roaring I have met with in the human subject: a young gentleman, an acquaintance of mine, who had suffered much from a violent attack of *cynanche laryngea*, used to fetch his breath so hard, though with more apparent than actual labor, in walking fast up hill, and with a noise so in unison with the pipe of the whistler, that, when I first heard him, I turned myself suddenly round under

an apprehension that a horse of this description was approaching at full speed at my heels.

A *high-blower* is a horse that under moderate exertion draws his breath hard and with apparent difficulty, and makes an unnatural puffing noise, at every respiration, which, it strikes the bye-stander, is produced by the nostrils. And I believe that in these cases, if they are genuine, the impediment is to be sought after in the air passages of the head, whence the dilated nostrils, and the sonorous puffs from them, when the animal's breathing is accelerated.

The *grunter* is so called from the utterance of deep-seated murmurs, or sounds that bear a comparison with the grunts of a hog. This noise in the breath is not always generated under ordinary exercise; it is oftener produced by a sudden respiratory effort, the effect of some unexpected event: a sudden clap of the spur while riding, or an unlooked-for lash of the whip while driving, will often call forth one of these ejaculations. We must take care however not to confound this affection with the occasional grunts of a horse whose bowels are distended with air or food, or whose body is loaded with fat for want of work, nor to mistake for it those sounds which proceed from a tight collar: these latter are only temporary inconveniences, and often arise under ordinary exercise, whereas this is mostly a permanent and an irremediable annoyance, and is only producible with laborious or violent respiration. In my opinion, this is a pulmonary disease - a sequel of inflammation: I have lately met with a well-marked case that was immediately preceded by an attack of *pneumonia chronica*. This species of roaring very often escapes observation.

The *roarer*, or, as he is often designated, the *confirmed* roarer, utters his complaint more clamorously than any of them to whom I have had occasion to append a description: he is so vociferous, when his respiratory actions are violently exerted, that he unequivocally proclaims, in loud and insuppressible boations, his distressing malady to all around him.

Having endeavoured to point out and distinguish the various species of roaring that are met with in practice, I shall now make mention of the methods commonly resorted to for their detection, and afterwards attempt to show how far veterinary pathology has discovered their seats, or coupled their symptoms with certain morbid appearances.

In order to elicit that sound in the breath which is the test of this disease, it is necessary, generally speaking, that the animal be excited to make a sudden or forcible respiratory effort. Now, it has been a question of late (I wonder it was never agitated before) whether roaring is an act of inspiration or expiration: some steadily maintain the old positions and say that it consists in an expiratory effort, while others venture upon new ground and contend that it is an accompaniment to a violent inspiration. As frequently happens in like disputes, I believe that both parties are in the right, and that the circumstances of the case only require to be examined to prove it: *e.g.* if the horse is a high-blower, or, in other words, if the impediment to the passage of air is seated in the chambers of the nose, the sonorous puffs, we hear, are so many *expiratory* acts; whereas, if the obstruction is in the trachea or bronchiæ, the roaring sounds are sighs or *inspirations*; and when the glottis is narrowed, and sometimes indeed

when the trachea is, the noise may be produced both by the ingress and egress of air, then however it is generally loudest in inspiration. Any instantaneous shock, or cause of alarm, hard galloping—especially up hill, and the excitation of coughing, are the common trials to which the animal is subjected to make him roar; indeed, the most ready mode of proceeding is that in vogue with our *copers:* it consists in making a feint to strike the horse upon the body with a stick or whip, and in doing it suddenly and unawares, and with as much earnestness as though you were actually going to knock him down, at the same time that you are holding him short and fast by the head with the left hand. Although these are the most ready expedients we can adopt, I agree with Mr. SEWELL in not considering them as the most worthy of reliance, and consequently in regarding them as inconclusive in many cases that are no confirmed roarers; actual and continued corporeal exertion is occasionally required to extort the sound; and the practice of putting such horses in harness and making them pull heavy loads up hill, is after all probably the best trial that we can make of their wind. Simply the act of coughing is a very indecisive test of roaring; and now and then, as the Assistant Professor justly remarked to me, the larynx being in part or wholly bony, coughing cannot be excited at all by compression of it; though then to an experienced tact, the very inflexibility of it is a presumptive proof that the disease is present.

In entering upon the *ratio symptomatum* or theory of roaring, I may observe that it bears an analogy to croup, both in relation to the proximate cause and to the parts affected; but we must be on our guard not to

carry this comparison too far, or it will lead us into serious pathological error, for, although I may broadly assert that the proximate cause of roaring is grounded in *cynanche trachealis*, the inflammation does not put on that type which makes croup so formidable and dreaded a malady in a human being, nor is it confined to the years of unmaturity. When roaring does happen in colts, it generally exists as a mode of termination of strangles: the catarrhal affection that accompanies strangles now and then continues long after the wound in the throat is closed up, leaves the laryngeal membrane thickened and perhaps ulcerated, and thus lays the foundation of this disease.

But, not only catarrhal affections, many that are considered as inflammation of the lungs, terminate in roaring, for, in truth, the symptoms of this species of membranous inflammation are not, at all times, so diagnostically marked as to enable us to steer clear of this error; and what renders cynanche trachealis infinitely more obscure and insidious in its attack and course, is, that in the majority of cases the inflammation is of that mild chronic type which is apt to escape the notice of those to whom we must look for the first reports of ill health: and hence it is, that we are continually meeting with so many roarers in whom nothing is known about the inflammatory action to which they owe their present malady. Seeing, then, that cynanche trachealis is the common fore-runner of roaring, and that upon our knowledge of the one must mainly depend our competency to treat the other, I shall detail here the symptoms by which its existence is indicated.

Under an acute attack of cynanche, the horse breathes short and quick, but, at first, generally with more pain

than embarrassment; he emits sudden and often sonorous puffs from his tense and dilated nostrils, and at every inspiration exposes to view the septum deeply imbued with its own blood; his pulse is small, hard, and frequent; he has paroxysms of coughing, occasional guggling or rattling in the throat, and defluxion of pus from the nose; and the lightest pressure upon the larynx, or grasp of the windpipe, very much annoys him and induces the cough: added to which, he has the other ordinary concomitants of febrile commotion. In some cases, when the inflammation is at its height, spasms of the larynx come on, during the continuance of which respiration is carried on with so much distress that the animal is, every now and then, threatened with suffocation; or the breathing may become embarrassed from a thickening of the membrane where it lines the glottis.

Did the disease commonly manifest itself in this acute form, there would be no room for doubt, as to the nature and tendency of the case; but, as I observed before, it approaches and creeps on in that insidious way that the foundation of roaring is actually laid before it is discovered that the proximate cause—inflammation, has been present in the air passages: at least, so it is with the generality of cases. Were the animal, from the first, placed immediately under our own eye, we should probably be able to detect some signs that would raise our suspicions of what was going on: such as, an unusual protraction of, or a fresh attack very like, a chronic catarrh, accompanied with soreness about the throat, perhaps some rattling or guggling noise in it, and a hard cough; disturbance of the respiration and pulse—short wind; little or much purulent defluxion

from both nostrils; and increased susceptibility of the trachea and larynx on compression.

The causes of cynanche will, of course, be such as give rise to catarrhal and pulmonary affections in general; in fact, as we have seen, it often turns out to be an extension or a sequel of the former, and may exist as a precursor of the latter. But there is one fact connected with its etiology, which, if borne in mind, will often throw much light on the nature of the case, and enable us to frame in our own minds a pretty correct diagnosis; and that is, that a large proportion of these subjects are harness horses—horses whose necks have been rambowed by the bearing rein for hours together, and whose larynges have been compressed, and tracheæ distorted, by this unnatural and constrained position of the head and neck.

It may be remarked here, that simple flexion of the pipe itself, from the forcible and continued incurvation of the nose towards the chest, has been known to produce roaring. Mr. W. Goodwin, Veterinary Surgeon to his Majesty, informed me, that, during his professional avocations at St. Petersburgh, his attention was especially drawn to several horses, who by himself and others had been declared to be roarers, in consequence of their having got rid of their complaint in the manage. These horses, it appears to me, roared from unnatural flexure of the windpipe; and this distortion the Russian system of equitation, which consisted in the continual elevation of the head and projection of the nose, was well adapted to counteract, and in process of time remove. The inconvenience, at first, is only temporary; the intervals of relaxation give the parts an opportunity, for a time, of recovering their wonted tone and shape; but repeated

and long-continued acts of such violence may so enfeeble their elastic powers, that permanent deformity of the larynx or pipe may result, and the malady become an irremediable one. Mr. SEWELL, with much reason, censures the practice of buckling neck-straps, or the throat-latches of collars and bridles, tightly: it is obvious that all this is uncalled-for and wanton mischief, not to add cruelty.

Mechanical injury, then, is one of the most frequent causes of roaring; and it may be either a *proximate* one, as in the case we have just been examining; or it may be an *exciting* cause, as in the case of cynanche. It is said, by some, that the practice we have of making horses cough by compressing their throttles is apt to induce roaring; but I do not think myself that the continuance or repetition of this act is such as to do harm, regarding it either as one that may permanently deform the pipe, or as a common mechanical excitant of inflammation; and therefore I do not consider it, in itself, as one of the causes of this disease.

Having, thus far, considered the symptoms and exciting causes of cynanche, and examined one of the immediate or proximate causes of roaring itself, let us pass on to particularize, and endeavour to account for the origin of, others which dissection has discovered to us. Cynanche may terminate in a variety of modes, and in one or other of these terminations may be said to consist almost all the proximate causes of roaring that remain to be described. The most common effect of inflammation of the air passages, is a thickening of the lining membrane; which, if it happen in that part of it that lines the chambers of the nose, will give rise to that thickness and pursiness in the breath in which consists the complaint of the

high-blower. But the part where this increment offers the most impediment, and consequently creates the greatest inconvenience, is the glottis, the fissure of which is very sensibly diminished by the morbid thickness of its lining; and thus is produced roaring, or confirmed roaring, or, if the opening be much contracted, whistling. Though the calibre of the trachea may also be equally diminished by this interstitial deposit into its membrane, it admits of some doubt in my mind whether this, of itself, can be adduced as a proximate cause of roaring; but, if the same deposition pervades the bronchiæ, it may either be productive of *thick wind*, or of wheezing. In horses in whom this state of parts has existed long—probably several years, the membrane, in consequence of undergoing a gradual organic change, assumes a variety of morbid aspects: it may be found simply thickened; or thickened, opaque, and white, or thickened and indurated, or corrugated, or reticulated, or tuberculated, or ulcerated. these last alterations however may proceed from another source. We now and then hear of cases, of most of which I am inclined to think that this is the pathology, that become roarers by *metastasis:* Mr. Coward, Veterinary Surgeon, Royal Artillery, related to me one of a horse of his own, in whom extensive tumefaction and suppuration of the jugular vein followed the operation of venesection, which was succeeded by abscess of the parotid gland, and terminated by disease of the larynx and permanent roaring.

The next morbid appearance met with, in point of frequency, is a band or distinct layer of adhesive matter, which is thrown across, or adheres to, some part of the larynx or windpipe. The situation and disposition of this solid effusion vary much. sometimes a band is simply

formed across the passage, or that is joined by another generally coming from the back part, by which the canal is divided into two or three passes; at other times, the deposition is seated in the cellular interstices between the muscular band and the rings, so as to protrude the former and thus narrow the main conduit. So that the adventitious substance here has not the disposition, nor does it put on the appearance, of that found in croup. This state of parts is also productive of confirmed roaring *.

Tumors of any kind seated within or in the vicinity of the air passages, may, by partial obstruction or compression of them, prove to be causes of roaring. What is most commonly met with, is an abscess in the throat that presses more or less upon the epiglottis; and this occasionally creates very alarming symptoms, and would bring on suffocation and death were not the operation, termed bronchotomy, (which I shall hereafter describe,) had recourse to. Mr. SEWELL met with a case of roaring in which he found an exostosis, growing from the cervical vertebræ, between the two first ribs, that pressed upon the windpipe.

Another and not a very uncommon cause of roaring, is a wasting, or, in some instances, a total absorption of one or more of the small muscles of the larynx. I have lately examined a horse of Mr. C——Y's, a re-

* In the museum at this place is a preparation in which the muscle has been displaced by the formation of a cross-band of adhesive matter between it and the *posterior* part of the tube, by which the interspace is divided into two passes, one of which is large enough to admit a walnut, the other a hazel nut the horse it was taken from, breathed with great labor under exertion, and, even when but moderately exercised, roared aloud

markable instance of it: in his larynx, upon the near side, the crico-arytenoideus posticus, was very pale, and shrunk to half its original size; the crico-arytenoideus lateralis, the thyro-arytenoideus, and the arytenoideus, were altogether colorless, and scarcely recognisable as muscles; but their antagonists, upon the other side, were unusually red and strong. Now, these muscles, contracting in pairs, are all employed in dilating the glottis; but, if one set act by themselves, this orifice is not only distorted, but actually diminished in dimension, in consequence of the arytenoid cartilage of the opposite side being drawn over it: thus it is then that roaring is here produced. How we are to account for these changes—to what original cause refer them, is as yet unknown: by some, they are loosely spoken of as the ultimate consequences of paralysis, or of spasm; but, though these tales may satisfy their employers, they are no more, to the profession, than the baseless conjectures of their authors, and as such are deserving of no comment here.

A frequent concomitant, and occasionally a cause, of roaring in old horses, is ossification, partial or complete, of the larynx: the thyroid cartilages commonly take on this change of structure; the others however in the advanced stage often partake of it. But rarely do we meet with any bony accretion of the rings of the windpipe: now and then, we detect osseous depositions in some of them, but I do not apprehend that any, or but little, inconvenience is thereby occasioned.

I have already shown that the tracheal canal is very subject to distortion from the injurious practice of reining in; about six months ago I saw a wet preparation from the appearance of which I feel little hesitation in add-

ing, that the canal may be mis-shapen from original mal-formation. In this specimen, the passage was triangular, the sharp angle was turned forwards, the flaps of the rings posteriorly over-lapped one another much beyond what was natural, and the membrane throughout was thickened: there cannot exist a doubt that the animal, it was taken from, was a roarer, and most probably an inveterate one.

WHITE has found out that an ulcer in the larynx is a cause of roaring: I wonder he did not find out, much about the same time, as the inference lay so straight before him, that, if this were true, many horses acutely glandered must be roarers too! The simplest fact in the physiology of roaring is this—that, to produce it, the respired air must meet with impediment or obstacle somewhere in its passage; and so, unless this position be groundless, a bare ulcer in the larynx has just as much to do with the act as an ulcer in the tail. I dare say that WHITE has seen ulceration of the larynx, and so has every one who has been in the habit of dissecting these subjects; but, it appears, that he has not perceived the tumidity or thickening of the membrane which is so common a concomitant of that state, and therefore he adds, just as superficially as, it seems, he examines, this was "the *only* morbid appearance to be found."

Doubtlessly there are other pathological varieties connected with the production of this disease; but I believe that I have described them that are most useful to us, as guides in our daily practice. The chief considerations are—that there must be contraction of the air passage, or partial obstruction in it, somewhere; that according to the degree of narrowness, and the situation of it, *cæteris paribus*, will be the kind and loudness of the sound;

and that upon the power of restoring the capacity of the passage must depend the efficiency of our remedies towards removing the evil. With a view of ascertaining the degree of constriction necessary to the production of roaring, and of watching the symptoms of pain or uneasiness evinced by it, I passed a ligature of broad tape around the windpipe of an ass, about one-third of the way down the neck. The tape was first drawn with moderate tightness, and the animal roared when made to trot; the pipe was then compressed to about half of its natural calibre, and the animal whistled: in both states the sounds were loudest in *inspiration*. At length, I drew the ligature as tightly as possible, in about a minute afterwards, the animal, after having staggered about much, fell, struggled violently, and, apparently in great agony, expired in a sudden convulsive throw of the body upon one side, about two minutes after he had fallen. I found the membrane of the windpipe reddened and covered with frothy mucus: the passage was *not* completely obliterated, I could still pass a crow's quill through the constricted part of it.

I have heard Mr. Coleman say, in his lectures, that roarers are generally sound-winded horses, and, so far as regards the healthy state of their lungs, I agree with him; but it is a fact well known to people who are in the habit of riding with hounds, that roarers are always more distressed in the chace than sound horses, and that they cannot bear to be hard pressed up hill, and the experiment I have just related, while it corroborates, serves to elucidate this point. For, it would appear, that not only are sound lungs essential to a full and healthy respiration, but that a clear and uncompressed passage is also absolutely necessary to it, and that, how-

ever disproportionably large the calibre of the trachea may seem when contrasted with its narrow entrance, the glottis, a very trifling contraction of the former, will create noise enough in the breath to convince us that there is a degree of embarrassment in the performance of respiration. Moreover, I shall now show, that the *lungs* themselves may be the *seat* of roaring. Some years ago, a horse, belonging to the Artillery, was treated by my father (who is the Senior Veterinary Surgeon of the Regiment) for violent roaring. The neck was repeatedly blistered; it was also fired; but no relief was given. So painful was it to hear this animal roar, when he was even led out of the stable, that bronchotomy was tried; but without benefit. At length, the animal suffered so much from pain and distress in breathing, that, being in that condition useless and found insusceptible of relief, he was destroyed. There was detected no thickening of the membrane—no disease whatever, in fact, of the larynx or trachea; but the lungs were hepatized throughout their substance, and the smaller divisions of the bronchiæ, in many places, so compressed that they were hardly pervious. I know that this case is not reconcileable with the opinions of the day; and therefore I set the greater value upon it: it is one also that is admirably calculated to silence the trumpery of those who are continually persuading people that *they* can *cure* roaring horses.

Let us now pass on to the treatment of roaring. Some of my professional cotemporaries have contended hard for celebrity with the obstacles that are encountered in this alluring field for experimental research; but, they would have spared themselves much labor if they had (and it is generally the nearest road to a cure, after

all,) directed their investigations vigilantly, but patiently, to the *cause* instead of the removal of the disease. Which of them, I should like to know, can attenuate a thickened and indurated membrane?—or which of them, by tying up a horse's head, and confining it for a twelvemonth in that position, can remove an organized band that crosses the passage?—in a word, which of them can proceed *secundum artem* to cure a disease of the nature of which he, by his own confession or silence, is either doubtful or ignorant? CLATER, who surpasses WHITE by half-a-score of editions—*ergo*, according to his own account, just so much in excellence *, presents us with a very innocent *recipe* for the dispersion of these trifles:—a few *aniseeds* and *carroway seeds*; and a little *Dover's powder*, mixed with *balsam of sulphur*, and *the yolk of an egg*; which together will take just as much effect upon the animal as looking in his face will, or as WHITE's *squills*, *ammoniac*, and *aniseeds*, will in broken wind. I need not expatiate on such statements: I trust I have said enough to expose the baseless fabrication of them, and to convince scientific practitioners of the necessity of investigating causes before they proceed to unravel or remove effects.

When a roarer is brought to us then, it behoves us to take every means in our power to ascertain the special nature and stage of his disease; to which end, we ought to inquire narrowly into the history of the case, and make ourselves acquainted with every little circumstance

* "The rapid sale of *twenty-three large* impressions of this work has established its character upon the surest foundation." *Every Man his own Farrier*, by FRANC CLATER; the 24th Edition Vide *Introduction*.

connected with it, before we proceed to examine the horse himself; and in doing this, we must take care to attend to the sound that is uttered. Having formed our diagnosis, the treatment to be pursued will naturally suggest itself.

If it be a case in which deformity of the windpipe can be felt, and there appear reason to believe that it owes its production to forcible incurvation of the neck, the continual elevation of the head, and the confinement of it by side lines, or the frequent bitting of the animal, so as to project his nose forward, are means well worthy of trial: we must not forget however that the success of this experiment will depend upon the duration of the complaint; nor must we overlook any inflammatory action that may be present in the system, which might prohibit such measures.

This, I believe, is but rarely the state of the case however; almost always, if the affection be recent, have we to combat with inflammation, of an acute or chronic kind; the remedies for which, as it so often assumes the catarrhal form, I need but recapitulate here. Venesection is generally required in the chronic stage; but, if the cynanche be active, it is imperiously demanded: the frequent repetition of it too, is an excellent practice. Active purgatives—nauseating and diuretic medicines in the intervals—and blisters along the whole length of the windpipe, that are kept discharging, are to be resorted to: no rules can be laid down for their judicious use; that must be left to the discrimination of the practitioner. When active depletion is no longer admissible, counter-irritation often proves of great service: it should be persevered in by a renewal of blisters,

or by inflaming the skin covering the pipe with the actual cautery—a practice I myself do not approve of, or by the introduction of setons.

When the animal roars to that degree that respiration, even in a state of quietude, becomes a painful and laborious duty, or that he is threatened with suffocation, we have recourse to an operation which consists in making an opening into the larynx or trachea, and has been named *bronchotomy*. When the larynx is to be opened, the ligamentum crico-thyroideum is the part chosen for incision; but of the windpipe any of the rings may be slit open crosswise: the place of operating must, of course, depend upon the site of the obstacle or constriction in the passage. The aperture may either be a simple longitudinal incision, through which a metallic or flexible canula can be introduced; or it may be made square or circular in itself, by excising a portion, an inch in diameter, of the ligamentum crico-thyroideum, or a section, an inch in breadth, of two of the cartilaginous rings of the trachea, in which case no tube is required: the latter mode of operating is now generally practised. While this temporary relief is afforded, we ought to make trial of every means in our power to remove the obstacle to respiration; for, unless this be wholly or in part effected, the animal must eventually relapse into his former, or even a worse state of suffering.

Some years ago, there was quite a professional mania for performing bronchotomy, and, from what I can learn, it sprung up from the successful excision of one of those bands of lymph which cross the windpipe. I have not been fortunate enough to meet with the particulars of the case, nor the name of the operator; but,

admitting the truth of it, it is evident that this was altogether a fortuitous event, and that all the credit that was due to him arose out of the dexterity he evinced in the operation, and that no little discredit was due to them who were silly enough to suppose that they might make a similar discovery wherever they chose to cut a hole into the windpipe. Had I any reason to suspect that this was the state of the case, a rational mode of procedure appears to me to be this:—first, I would make an incision through the ligamentum crico-thyroideum; secondly, unless this relieved the roaring, I would make another into the middle of the windpipe; and lastly, if the animal still continued oppressed, I would open the pipe as low down as I could. By this means, supposing there was a band of lymph, or any other local obstacle, we might ascertain the exact site of it, and, by the introduction of a long whalebone probe, probably the nature of it: the propriety of extending these incisions, (which should be only longitudinal slits in the tube,) and the means to be adopted to remove the obstacle, must, of course, rest upon the judgment of the operator. Let us not forget however, that the principal design of this operation, is to afford instantaneous relief to the animal laboring under great distress in breathing, or threatened with suffocation; and that it can only prove effectual when the obstruction or constriction is above the place in which the opening is made.

LECTURE XXXV.

On the Viscera of the Thorax.

THE viscera which are inclosed within the cavity of the chest, and are distinguished as the organs of respiration and circulation, are performing functions immediately concerned in the support of life; and though it be an indirect mode of demonstration, we may, in some measure, convince ourselves of their vital importance by a survey of that cavity in which they are placed. Attached above to the bodies of the dorsal vertebræ, they are well fenced and defended on either side by the arches of the ribs, and the cartilages; while below and before they are protected by the keel-like projection of the sternum, and behind are opposed to the diaphragm, which forms a musculo-tendinous partition between them and the viscera of the abdomen: by these means, Nature has not only shielded them from external injury, but has secured to them the uninterrupted performance of their respective functions.

Having opened the cavity of the chest, we perceive a considerable vacuity between its parietes and the contained viscera; a circumstance which, as I shall hereafter point out, is wholly referable to the unnatural condition

of these parts; for, in the living animal, (and also in the dead before the chest is opened,) this cavity is completely filled by its contained organs: so that, in fact, in the natural state there is no vacant space whatever in the chest; and we are not perhaps, strictly speaking, justified in using the word *cavity* at all.

The contents of the chest consist of the pleura, mediastinum, and lungs; and of the pericardium and heart: in addition to which, it contains several large blood-vessels and nerves, the thoracic duct, and some small glands.

On the Pleura.

The pleura is a thin semi-transparent membrane, lining the cavity of the chest, and giving a covering to the lungs. By that portion of it which is called the *mediastinum*, the cavity is divided into the right and left *sides* of the thorax.

If I expose the lungs, by breaking off one or two of the ribs, we shall perceive that their surface, as well as that of the cavity itself, is every where smooth, polished, and humid: this is owing to the extensive investment of the pleura, the interior of which I have now presented; so that, in truth, if I introduce my hand, I am unable to touch any part but pleura; although, from its extreme tenuity and pellucidity, the viscera appear, on a superficial view, to present to me their own bare exterior. Its outside, on the contrary, is rough, having numerous cellular flocculent appendages, by which it is united to the parts it invests: and so close and firm are these adhesions, that to cleanly detach it, in the recent subject, is a difficult and very tedious dissection.

The pleura is a *reflected* membrane; by which I mean,

one that not only lines the cavity in which the viscera lie inclosed, but, by duplicature, or what in anatomical language is called *reflection*, gives a partial or complete covering to the contained organs themselves. It is evident, therefore, that such a membrane admits of division into two portions :—a *lining* or *parietal*, and a *reflected* portion; which, with regard to the pleura, have, for the sake of more accurate description, received the names of *pleura costalis*, and *pleura pulmonalis*: they are both however continuous at all points, are precisely similar in structure and function, and, in fact, are still but one and the same pleura.

There is yet a third portion of this membrane to which a distinct appellation has been given, and that is the mediastinum; it differs from either of the others in being composed of two layers, which are derived from the two pleuræ of the opposite sides of the chest; for the pleura even constitutes this membranous partition. If we conceive the pleuræ of the two sides of the thorax to be perfect sacs or bags, the flattened sides of which are closely applied and united together, in such a manner that the double membrane formed by their union extends through the middle of the chest, from the dorsal vertebræ to the sternum, we shall at once have a tolerably correct idea of the formation of the mediastinum.

The pleura, from the nature of its secretion, is one of those included in the list of serous membranes, to which it has been demonstrated also to be similar in its intimate organization; like them, it presents a shining secreting surface, of a whitish aspect, and considerable transparency, and is composed of little else than condensed cellular substance, whose texture is penetrated by blood-vessels, absorbents, and nerves: by long ma-

ceration in water, indeed, it may be entirely resolved into cellular membrane. In most parts it is extremely thin, and by no means tough; but it is not so in all, for that portion which faces the diaphragm is much denser and stronger than the pulmonary or costal division of it.

The arteries of the pleura, which come from the adjacent parts, are in the natural state exceedingly small, and admit only the colorless parts of the blood—a circumstance that accounts for its pellucidity; under inflammation, however, they contain red blood, and are the cause of that arborescent vascularity upon the sides of the chest in horses that have died of pneumonia; than which state nothing can better demonstrate the comparative number and distribution of these blood-vessels. The majority of them terminate in exhalent orifices, from which is continually poured upon the contiguous surfaces of the smooth interior of the membrane, a serous fluid, in the form of steam or vapor, which may at any time be rendered visible by opening the chest of an animal recently dead. The absorbents of this membrane are very numerous; and though their extreme exility prevents us from demonstrating them in a state of health, yet may they often be seen in considerable numbers in horses that die of dropsy of the chest; we have also abundant proofs of their existence from various phenomena that occur in the diseases of the part: we know, for instance, that these vessels take up the serous fluid effused in hydrothorax, for they have been found full of it after death, and it is a fact that no longer admits of doubt, that blood, extravasated into the chest, is absorbed by the mouths of these minute vessels.

The nerves of the pleura are too small to be traced by

dissection; but, though it is not possessed of much sensibility in a healthy state, we know, at least we presume from analogy, that it is highly sensitive in the diseased; for few diseases are more acutely painful in the human subject than pleurisy, and we have every reason to believe that horses suffer much from the same malady.

I have said that the exhalents of the pleura secrete a serous fluid, which is emitted, in the form of an exhalation, or vapor, into the cavity of the thorax; and that you may see it at any time, if an animal, recently dead, be opened while yet warm; or, if an opening be made into the chest of a live animal: in either case, a whitish steam will be perceived to issue from the interior of the cavity. This vapor, shortly after death, becomes condensed and converted into a liquid; so that we always find the contiguous surfaces of the pleura moist, and a collection of more or less fluid, resembling water, in the most depending parts of the cavity. In consequence of every part of the membrane being bedewed in this manner, the lung itself may be said to be in an insulated state, for the pleura costalis does not, philosophically speaking, touch the pleura pulmonalis, nor is the latter in actual contact with the mediastinum; all friction therefore, in the motions of these parts, is by this interfluent secretion effectually prevented. In this, then, consists the chief use of the pleura, viz. to furnish a secretion, for the purposes of lubrication and facility of motion, which it further facilitates by its extreme glibness of surface: it is said also to answer the purpose of ligaments to the contained organs, thereby confining and strengthening them. The use of the mediastinum is to divide the chest into two compartments.

Diseases of the Pleura.

Although the horse is more disposed (as well as the human subject) to diseases of the viscera of the chest than of any other set of organs, yet it has been asserted, that we have not the same grounds for making a distinction between those of the pleura and those of the lungs that practitioners of human medicine have. In man, it is said that this membrane is now and then the seat of inflammation to the exclusion of concomitant disease in the lungs, and that this affection, which has been named *pleuritis*, may be known by the presence or prevalence of certain symptoms; such as acute pain, generally referred to but one side, which is increased by coughing, or deep inspirations, accompanied with a pulse, frequent, small, and threaddy: though the latter, indeed, denotes membranous inflammation anywhere else. So little dependance, however, is put in this diagnosis by some of the most eminent physicians, that both pleuritis and peripneumonia, or inflammation of the substance of the lungs, are commonly spoken of, and indeed are described by some under the name of *pneumonia*; by which is meant, an inflammation of the mixed kind—one affecting both the lungs and their surrounding membranes at the same time. It seems to be admitted then that genuine pleurisy is a rare disease even in the human subject, and I am ready to concede thus much in regard to its presence in horses; but I must dissent from them who would deny its solitary existence altogether.

Not, however, that this observation is of much service or importance to us in practice; for, though I am convinced from dissection of its truth, I do not pretend to determine, during life, whether the case be one

of pleurisy, or of peripneumony, or of pneumonia, though, by referring it to the latter, I should, perhaps in nineteen cases out of twenty, find myself right in my diagnosis. That more horses, however, that die of acute thoracic disease, are cut off by pleurisy, and its consequences, than by peripneumony, is known to every practitioner, but, then, in most of them the lungs partake more or less of the diseased action. Fortunately for us, however, (as well as for surgeons,) after all, it amounts to this—that there is no important or essential difference in the treatment of the case, whether it be one of pleurisy or peripneumony, or of both; and fortunate indeed is it for the dumb animal, inasmuch as two of the characteristic symptoms consist in the particular seat and kind of pain felt, about neither of which can he give his medical attendant the least information *.

Hydrothorax.

HYDROTHORAX, the common termination of pleurisy in horses, consists in an unnatural collection of a

* "Perhaps my readers may be surprised at my not having given some cases of pleurisy in this work, but I conceive it to be too nice a distinction between this disease and an inflammation of the lungs, *for men who are not in the constant habit of the practice of physic*, and that the most perceptible distinction worth attending to is, that the horse is more frequently lying down and rising up suddenly, the inspirations are much shorter than in a local inflammation of the lungs, the horse is very frequently turning his head back, and putting his nose to the parts apparently most in pain, which to my knowledge has frequently given rise to *farriers* and *others* to mistake an inflammation of the pleura and lungs for a spasm in the intestines, commonly called the gripes. I have often found, in cases of this nature, after horses have died with what is termed the gripes, that there was a *violent inflammation of the pleura*, sometimes with but *slight inflammation of the lungs*, and other parts." SMITH'S *Cases of Farriery.*

watery fluid in one or both sides of the chest: the latter case is the most frequent. In some few instances I have found the fluid either confined to the anterior or posterior part of the cavity by a transverse wall of adhesive matter, or collected within a pouch or cyst of the same substance: this is what is denominated *encysted dropsy* of the chest.

It was formerly thought that this (as well as all other dropsies of the body) originated in diminished absorption; but it is now believed to arise (I may say always) from increased action on the part of the exhalents, the result of inflammation of the pleura: here then is one fact, at least, to shew that this membrane is very prone to disease even in the horse. Very large quantities of water are occasionally effused in this way: I have often seen ten or twelve gallons measured from the chest after death; but, from a troop horse that was tapped for this disease in the Royal Horse Infirmary, sixteen gallons were drawn; a quantity that must be considered prodigious, when we remember that some still remains in the chest in all these cases, in consequence of the apertures not being made through its most dependant parts. In the generality of cases, the fluid itself is transparent, of a bright yellow color, and indeed in its appearance and properties is similar to serum: when it is found turbid, it is generally owing to the commixture of purulent matter.

The existence of this disease is often indicated, with tolerable certainty, to the experienced veterinarian; for, though there is no single symptom that can be exclusively relied on, still the presence of many, equally characteristic, will furnish him in most cases with a pretty correct though not infallible diagnosis. If an inflammatory attack of the chest that has shown a

painful activity, after having continued for two or three weeks, or longer, abate, but not subside, and if it be succeeded by such a train of symptoms as follows, we may be pretty certain that the case has terminated in hydrothorax, *viz.* the respiration, which had become comparatively tranquil, shows fresh embarrassment, and grows short and quick; the pulse cannot be felt, or but very indistinctly, at the heart, and is small, weak, and frequent, and sometimes irregular, at the jaw; and anasarcous swellings of the legs, breast, and belly, and occasionally of the prepuce, make their appearance. As the animal continues to sink, which he does, day by day, like a man in the last stage of phthisis, his breathing becomes extremely irksome and painful, his head hangs low down under the manger, his legs are wide extended to give full play to his chest, he does not even notice his provender, and he moves but with great unwillingness and effort. These last mentioned symptoms however are but sympathetic; and of those which I have given as characteristic, there is not one, by itself, that may not prove fallacious. I have found water in the chest when the pulse has been free and perceptible at the heart, when there has been no anasarca, and when none of the tests I am now going to make mention of, indicated its presence. In some cases, by applying our head close to the side of the chest, we may hear a gurgling or rattling noise, occasioned by the undulations of the fluid during respiration; Mr. Sutton says, indeed, that he has felt it "*gush* against the hand *;" and now and then, cer-

* "Upon pressing the hand upon the side of the breast, the water may be felt to gush against the hand, but with more violence in the act of expiration than during inspiration." Sutton's *Cases of Farriery*

tainly, indistinct fluctuations may be perceived, by applying the hand, or the ear, against the ribs, while an assistant strikes smartly the opposite side: in this manner percussion and auscultation may be made of great service to us. Lastly, the stethoscope may be made trial of.

Our prognosis, when we suspect this disease to exist, must be always very unfavorable. Some few untapped cases may have had a fortunate issue; but of such we have no direct testimony. I have never seen a case, that had undergone the operation, of recovery myself; but I feel great pleasure in adding, that I am able to adduce two from indisputable authority.

The objects to be pursued in the treatment of hydrothorax are twofold: first, we are to diminish any excess of action that may show itself in the sanguineous system, and thereby lessen the effusion of fluid into the chest; and secondly, by increasing the action of the absorbent system, effect the removal of what is already accumulated. And fortunate would it be for our patient if these indications were as easily fulfilled, as in theory they would appear to be. First, then, we are to inquire, and narrowly inquire, how far inflammatory action is still present, (of which the state of the respiration and pulse are the leading symptoms,) and to take away blood accordingly: from four to six pounds are generally sufficient; for large venesections in this stage of disease invariably do harm. With the same view, we may exhibit small doses of white hellebore, which, by its nauseant effects, will tend most beneficially to lower the pulse and reduce its strength: in doses of a scruple, repeated twice or thrice a day, it will be found to answer this purpose extremely well. I often conjoin it

with a proportion of calomel and some common turpentine *, in order to augment the secretions of the chylopoietic and urinary organs at the same time. Blisters frequently repeated to the sides, with the aid of rowels and setons, are likely to do good by keeping up counter-irritation and discharge. I have, in several instances, substituted corrosive sublimate for calomel with apparent advantage, in consequence of its greater activity; ten grains of it twice a day, in conjunction with hellebore and turpentine, is as good a medicine as can be administered: nitre may be added if it be desirable to increase the diuretic effect. Purging should be avoided: aloes, unless it be given in laxative doses, generally proves hurtful.

I have in several cases performed the operation of *paracentesis thoracis* or tapping; but in none with a successful result. From an old horse I drew ten gallons of water by means of a trocar made long for the purpose, seven quarts from the left and thirty-three from the right side of the chest; he died on the fourth day afterwards without having been apparently benefitted; after death, six gallons of fluid were found in the chest, and about one quart in the cavity of the pericardium. In another case, twelve quarts were drawn off from the left side of the chest, and five days afterwards, as the animal had not shown any relief, five more were taken from the right, by the last operation, the symptoms appeared to have been aggravated instead of mitigated: death ensued on the third day after it. On dissec-

* We generally make use of the following formula:
℞ Pulv. Rad. Veratri; Hydr. Submur. sing. ℈j.
Tereb. Vulg. ℥ij.
Pulv. Glycyrrh. q. s. ut ft. Bol.—ter die sumendus.

tion of this subject, as occasionally happens when the disease has been of long duration, I found a quantity of pus floating in, and partly mingled with the water, which now amounted in both sides to three gallons.

Though unsuccessfulness has attended my experiments to preserve life in this manner, I have the gratification to announce that two cures have been thus performed under the skilful management of my friend, Mr. SEWELL; by whom I have just been favored with the subjoined accounts of them *.

* On the 10th of August, 1823, a bay horse, five years old, was admitted into the Veterinary College, who had fallen ill the previous week with pneumonia, and had been bled and rowelled in the chest, and had taken laxatives. At this time he was much wasted in flesh, and so reduced that he faltered in his step as he walked to the stable. His respiration was oppressed and very quick, his pulse 75°, and his other symptoms such as denote the presence of hydrothorax. He was bled again, had aloes ℥ij given to him, was turned into a cool situation, had his legs flannel bandaged, and was ordered to have a light diet. The day following, when the ear was applied to one side of the chest and percussion to the other, undulations were perceived, which were most distinct on the right side. Having plunged a trocar into the left cavity, only an ounce of fluid was let out, but from the right, which was afterwards penetrated, four gallons of a serous fluid were drawn. This was followed by much abatement of the pulse and respiration. 18th, pulse 50°, respiration less oppressed, bowels open, appetite mended. Tapped the left side again without effect. 19th, pulse 45°, respiration tranquil. Tapped the right cavity and drew off two gallons. Sumat. Ferri Sulph. ℥ij. 22d, general amendment, pulse 40°. The right cavity was tapped again, but this time without effect. Rep. bol. 24th, coughs occasionally. 26th, pulse 38°. Omit. bol. He gains flesh surprisingly fast. Nov. 7th, has lost his cough, and being considered sufficiently recovered, is discharged —cured. On the 7th of January following he experienced a fresh attack of pneumonia at strawyard; but there were no ac-

For the performance of this operation the best instrument is the common *trocar*: it should however be one of larger size than those in general use among surgeons: the *canula* of the one I have, which answers the purpose extremely well, measures four inches in length, and 5-sixteenths of an inch in diameter. As it is our object to draw off as much of the fluid as we can by paracentesis, the most dependant part of the chest should be penetrated; at the same time, the operator must take care that he does not pierce more parts than he is absolutely compelled to do. Bearing these considerations in mind, the preferable place for the introduction of the instrument is the space between the eighth and ninth ribs, close to their cartilages, not between the latter, lest we puncture the pericardium. Here, making the skin tense with the fingers of the left hand, the instrument, with its point directed upwards and inwards, may, with a little rotatory movement, gradually be thrust in until resistance to its entry suddenly ceases; when the trocar should be withdrawn, and the canula at the same time pushed onward, lest it slip out. The water seldom flows long in a continuous stream; either the lungs come occasionally in contact with the mouth of the canula, or

companying symptoms of effusion. He again recovered. After this, he worked and continued in health for two years, and was then sold.

Since this, Mr Sewell has had another case of recovery from hydrothorax. The horse was sold and taken into the country, and there Mr. S. lost sight of him.

The above case shews the absolute necessity of tapping *early*. It is one that holds out flattering prospects to the skilful and zealous practitioner; for, as he must plainly see, the life of the horse thus affected is entirely in his hands, and can only be saved by his penetration and prompt decision.

loose flakes of adhesive matter collect about it; to remove which we should, every now and then, introduce a large whalebone probe through the pipe. Sometimes, when the water is nearly run off, air bubbles through the pipe into the cavity. I never saw any harm arise from it; but, as it is only in the contraction of the chest that water under such circumstances is pumped out, the instrument, probably, had better then be withdrawn.

I am convinced myself, that paracentesis has been so unsuccessful from the irrecoverable state of the patients on whom it has been employed: Mr. SEWELL's cases, as far as they go, are conclusive upon this point. Whenever, therefore, symptoms make their appearance, in these protracted pneumonic cases, that induce us even to suspect the presence of water, we ought to tap without delay. The greatest evil that can arise from it, is puncture of the lungs; and from that I have not yet seen any ill consequences, when the operation has been conducted with that caution which characterises the scientific practitioner. I am persuaded that some of my cases would have been fortunate but for this delay; and I feel little hesitation in adding, that we shall soon have to record many instances of recovery from hydrothorax, if veterinarians will but try to discriminate these cases, and will institute *early* this bold but warrantable practice.

Adhesions.

WE seldom dissect a case of hydrothorax in which we do not find more or less adhesion between the pleura costalis and pleura pulmonalis; in addition to which, the membrane itself generally puts on a whitish or opaque aspect in places, and is there thicker and firmer than in the healthy condition.

The horse is not near so liable to the formation of adhesions as man, for very seldom do the schools of human anatomy obtain an adult subject for dissection in which the thoracic viscera are perfectly healthy, and adhesions are by far the most common morbid appearances that are met with: it would appear, nevertheless that pneumonia in horses, when it has been protracted, if it ends in death, terminates more frequently in hydrothorax and adhesions than in any other state of parts.

Little or no inconvenience seems to result from this disease, during life, in the human subject, for, though the lungs are probably somewhat restrained in their motions, as those organs and the ribs are every where closely applied to each other, and in common respiration move together, they are not likely to be much interrupted in their functions by a loose and partial connexion of their surfaces.

These adhesions consist of albuminous matter, and are at first destitute of vascularity, but, after a time, they take on organization, and become converted into membranous bands, whose texture resembles that of condensed cellular membrane.

The formation of adhesions will take place in the course of a comparatively short space of time; I have known a horse to be attacked with pneumonia, and to die within the space of seventeen hours after, in whom numerous adhesions of the lungs to the ribs were found on dissection. At this time, they consisted of yellow shreds of albuminous matter, pregnant with serum, connecting the pleuræ together, or hanging loosely from their surfaces, easily torn through, and apparently wholly inorganic: still, however, they constituted what in anatomy we denominate *adhesions*. In consequence

of the play of the lungs, adhesions soon become elongated when once they are formed, giving to the interior of the chest that *cobweb-like* appearance so familiar to every one who has been in the habit of inspecting the bodies of horses that have died of pleuritic disease.

When we reflect on the hasty strides that disease of this nature makes in the horse, we shall find ample reason to be exceedingly cautious in giving our opinion as to the *length* of time that it may have existed, merely from the presence, on dissection, of effused lymph or water, for I have, myself, strong reasons to believe, from some unquestionable facts, that the one may be deposited and form adhesions within the space of little more than twelve hours, and that three gallons of water may be poured out in the course of three days.

Pleurisy may terminate in *empyema*, or the effusion of pus into the cavity. Now and then we perceive flakes of pus, floating in the serous fluid collected in hydrothorax; but, should the matter be confined to one part by adhesions, an abscess will form, which, if it be timely discovered, may be discharged by an external opening.

Very lately, in a case of pleurisy that terminated in hydrothorax, after death, I met with numerous, little, red, rounded, membranous excrescences, growing from the surface of the pleura pulmonalis in places, adhering to it by short, thin, transparent productions of membrane. I do not know that a similar case can be cited in human pathology; they excited the curiosity of a surgeon, a friend of mine, who was with me at the time I made the discovery. I know nothing of their origin, and but little, as yet, of their nature: they are very vascular, consist of doublings of membrane infolding a little adipose matter, and are continuous with the

thin outer lamina of the pleura, with which they may be stripped off without any apparent lesion of their roots.

In the human subject depositions of osseous matter have been detected in the pleura. In the museum at St. Thomas' Hospital there is a beautiful specimen of this change, which, it appeared, did not give rise to any pleuritic symptoms during life: I am not aware that a similar instance can be named in veterinary practice.

LECTURE XXXVI.

On the Lungs.

THE lungs or lights are two soft, spongy, compressible bodies, occupying the greater part of the cavity of the chest.

They are the lateral parts, or *sides* of the cavity, that these organs lie in; where they are invested and confined by their respective pleuræ. Before the chest is opened, no space whatever exists between these organs and the costal arches; but, now, in the dead subject, they appear to be much too small for the cavities allotted to them. This arises from their being constantly inflated during life with atmospheric air, which preserves them in a state of expansion; as soon as the cavity is opened they suffer immediate collapse, and the consequences are, that the air is expelled, and they themselves become considerably diminished in volume.

The lungs are two in number—the *right* and the *left lung*, and are divided from each other by the mediastinum. A further division of these organs has been made into *lobes*:—that on the right side, the

larger of the two, consists of three lobes, the left, only of two: these lobes, which are nothing more than partial divisions of the lung by fissures of variable extent through its substance, serve to adapt them more accurately to the cavities of the chest, and, at the same time, render them fitter for the purposes of expansion and contraction.

The lungs of the horse, when inflated, are of great bulk *: the right is the larger of the two, for, in consequence of the heart being inclined to the left side of the chest, in reality less space is given for the left lung.

The lungs are attached superiorly to the spine (which attachment is sometimes called their *roots*) by blood-vessels, the first divisions of the trachea, and the mediastinal portions of the pleura; every where else, in a healthy subject, they are free and unconnected.

In form, the lungs of the horse are very like those of the human subject; and the latter have been compared to the foot of an ox, to which the injected lung of the fœtus bears indeed much resemblance; though the two lungs are not symmetrical, yet, both together, they put on this shape, which is the counterpart of that of the cavity they occupy. With regard to their general figure, however, the lungs may be said to be conical; being broad and concave posteriorly, where they are opposed to the convex surface of the diaphragm; narrow and somewhat pointed anteriorly, where they are received into the blind pouches of the pleura, in the space between the two first ribs.

In color, these organs are much variegated through-

* I consider, in comparison with the body, that they exceed in magnitude those of the human subject.

out their substance. Upon their surface they are of a pale red, inclining to a pink hue, spotted in places with purple and greyish patches; no very accurate notion, however, can be formed of their healthy aspect, without repeated examination of them in horses recently dead. If we cut into them, we shall find that they are of a much darker hue than upon their surface, owing chiefly to the blood they contain; for, after death, they generally possess more of this fluid than during life, in consequence of its accumulating within them in the act of dying.

On examination of the structure of these viscera, we find that they are composed of the branches of arteries and veins, and of the ramifications of the windpipe, and that these vessels are connected together by an abundant, intervening cellular substance, to which the name of *parenchyma* has been given. Beneath the curve made within the chest by the posterior aorta, the trachea divides into the two bronchiæ, of which the right is the larger, but the shorter: the left is the longer in consequence of having to pass under the aorta in order to reach the left lung. Having entered the substance of the lung, the right bronchia divides into four others; the left only into three; which difference arises from the right lung possessing an additional lobe; these branches may be traced for a considerable way within the parenchyma, giving off in their passage numerous other smaller tubes of similar structure; but, as we prosecute our dissection of them, we shall find that, in growing smaller, they partake less and less of the nature of cartilage, and that the extreme ramifications are entirely membranous in their composition. It will be remembered here, that, in my lecture on the trachea,

I described a membranous lining to it of the mucous kind which, I said, thence passed into the bronchial vessels; now, it is of the continuation of this membrane that the minute bronchiæ appear entirely to consist; at the extremity of every one of which it is formed into a kind of blind bag or cul-de-sac, to which the name of *air-cell* has been given.

From the arborescent ramification and peculiar mode of termination of the bronchial tubes, some anatomists have compared them, and the cells at their extremities, to a bunch of grapes—supposing the stalks to represent the ramifications of the bronchiæ, and the grapes connected with them the air-cells, others have described them as having a resemblance to a honey-comb. and so far as the knife, with the aid of glasses, can develope their intimate structure, the former is an apt comparison, insomuch as it relates to the disposition of their cells; the latter, insomuch as it conveys an idea of their ready inter-communication. For, though they do not communicate but through the ramifications of the bronchiæ, this is a medium of intercourse at once so general and free that numbers of them are inflated at the same time by impelling air into any one of the larger branches. with the parenchymatous substance however they have no communication whatever.

The blood-vessels that enter into the composition of the lungs are denominated the *pulmonary*. The pulmonary artery, having taken its origin from the right ventricle of the heart, winds upward to the root of the left lung, and there divides into the *right* and *left* pulmonary arteries, which divisions enter their correspondent lungs. The ramifications of these vessels accompany those of the bronchiæ, and like them divide and

subdivide, grow smaller and augment in number as they approach the air-cells; upon the internal surfaces of which they terminate in extremely delicate, thin, and transparent capillary tubes. Through these minute vessels every particle of blood is impelled every time it is circulated over the system, as I stated, when on the blood, a remarkable change of color is thereby effected in it, and we have now an opportunity of seeing in what manner this fluid is exposed to the influence of atmospheric air for the purpose. It is evident that no immediate contact can happen between the air and the blood, for the thin, transparent side of the vessel, if not that of the air-cell itself, must ever be interposed, so that whatever this influence be, it must take effect through these membranes. We might conceive indeed that such minute vessels could not transmit through them such a body of fluid as the blood; but when we look at the volume of the lungs and consider the incalculable number of air-cells they must contain, the globular surface of every one of which is furnished with a network of pulmonary vessels, we shall feel more surprise and admiration at the extreme division and diffusion of this fluid, in order to receive the necessary change, than that such a prodigious number of capillaries should be equal, in their united calibre, to the pulmonary artery itself.

From the extremities of the arteries, upon the surface of the air-cell, begin the pulmonary veins. These vessels, by repeated union with one another, form themselves into visible branches, and these again into branches of larger size, until, at length, they end in four pulmonary venous trunks, which proceed to, and terminate in, the left auricle of the heart. The ramifi-

cations of these veins, unlike the generality of others, are not more numerous than those of their correspondent arteries, and the reason of this is obvious, for, here, one set of vessels are not more subject to compression than the other, nor does the heart (which is so proximate to them) require any such mechanical aid, as an additional number of veins affords, to carry on the circulation. The function of the pulmonary veins is to convey the blood back to the heart, after it has received its due change within the capillaries of the air-cells.

Besides the above-mentioned blood-vessels, there are two others, named the *bronchial* arteries. They come off, by one trunk, from the posterior aorta, and each of them enters a division of the lungs, in the substance of which it branches forth and takes the course of the bronchiæ: they supply these tubes, as well as the coats of the pulmonary vessels and the parenchyma of the lungs, with blood, in fact, they may be regarded as the nutrient vessels of these organs. It has been however, and still remains, a subject of dispute, whether these vessels do *wholly* nourish the substance of the lungs, or not, some say that they do, while others assert that they are assisted in this function by the pulmonary artery, with some of the branches of which they anastomose. The latter opinion certainly does not appear to be supported by facts of much weight, on the contrary, the blood which the pulmonary arteries contain is dark-colored, and unfit for the nutriment of any organ, and, as for anastomosis, we have no demonstrative proof of its existence. The bronchial veins end in one trunk which returns the blood into the vena azygos.

The nerves of the lungs are derived principally from

a large plexus within the chest, constituted of the par vagum and sympathetic: they enter in company with the bronchial and pulmonary vessels, and continue their course with those vessels to be dispersed upon the bronchial membrane and parietes of the air-cells.

The absorbents of the lungs are large and numerous: we may often succeed in injecting considerable numbers of them upon the surface, by introducing a quicksilver-pipe under the pleura pulmonalis.

The connecting medium of the various constituent parts of these organs, or, as it is termed, their *parenchyma*, appears to consist of little else than cellular tissue, without any intertexture of adipose matter; it admits of the free diffusion of any fluid that may be extravasated into it—of air that may have escaped from the air-cells, or of serous fluid poured out when the lungs are anasarcous; but, as I said before, there is no intercourse between it and the cells or vessels, so long as the organs preserve their integrity of structure.

The lungs, when healthy, are exceedingly light in comparison to their volume; so that if they be immersed in water, unlike most other parts, they will float upon the surface, a fact familiar to every one who has seen the liver and lights of an animal thrown into a pail of water to be washed: indeed, the name of *lights* itself seems to have been given to them from this very property. If the fœtal lungs, however, be so treated, they will instantly sink to the bottom of the vessel, and this experimental result at once shews why those of an animal that has once breathed should swim, in the one instance they contain air, in the other they are wholly free from it, for, as I shall have occasion hereafter to explain, they are not to be regarded as respira-

tory organs in the fœtus. It is evident, therefore, that the lungs owe their property of lightness to the air they contain; and, as a further proof of it, if that fluid be by any means absorbed from them, and their bulk diminished by collapse of the air-cells, like other viscera, they will be heavier than an equal volum eof water: hence it is that the lungs of a horse that has died of hydrothorax, even though they are sound, are of greater specific gravity than those of one in health. It occasionally happens however, that these viscera evince, in this particular, the properties of airless lung, even though their natural volume and general appearance remain the same: I take it, in this case, they must be diseased.

I have already observed, that the lungs of the unopened thorax are in close apposition with its parietes, but that they recede from the ribs and other parts as soon as an aperture is made into the cavity. In order to make perfectly intelligible the explanation of this phenomenon, it is necessary to preface, that the lungs, of themselves, have no power of action; some degree of elasticity resides in their parenchymatous substance, but, I repeat, they are of themselves altogether passive, and as such are to be regarded in the functions of respiration. Their volume is augmented during inspiration, from the distention of their cells with atmospheric air, which rushes into them to fill the vacuum that would otherwise exist between the lungs and the parietes of the chest; it is diminished in expiration from the expulsion of that air, by the compression they receive in the contraction of this cavity. But, observe what happens if an opening be made into the cavity; the chest, it is true, can dilate as before, but how, or by

what means, is the expansion of the lungs to be effected? Not by the pressure of the atmosphere, for the weight of the air now upon their surface, which has been let in through the artificial opening, is as great as the expansive force of that within them, which has passed down the windpipe and bronchial tubes: the pressure and counter-pressure therefore of the atmosphere is now equal. Under these circumstances, the lungs, being passive bodies, fall together by their own gravity, or, as we technically express it, *collapse* and shrink into a less volume than when they lie simply unexpanded in the perfect chest.

If we take a bladder, inflate it, and lay it upon the table, without tying up its mouth, we know that the air will rapidly be expelled from it, in consequence of the upper side gravitating upon that which lies in contact with the table, and thus it is in the collapse of the lungs; the pressure and counter-pressure of the atmosphere being equal, their own gravity forces out most of the air they may contain. But it appears that the lungs, when the chest is opened, suffer a more speedy and complete collapse than what could be effected by gravity alone; a fact that is rendered more striking by removing them from the body and inflating them, and one that we cannot very well account for, unless we ascribe it to (what indeed is now pretty generally acknowledged) elasticity, a property that probably more or less pervades the several tissues entering into their composition.

On the Bronchial Glands.

THESE are small oval-shaped bodies, collected about the root of the windpipe, and trunks of the bronchiæ.

just as they enter the substance of the lungs. They are of a dirty, French grey hue, interspersed with dark bluish spots, and are about the size (though this varies much) of a tick-bean. It was formerly supposed that these glands secreted a peculiar fluid, which was conveyed into the lungs, and imparted that remarkable motley aspect to the parenchyma, but it has of late been ascertained that they are nothing more than absorbent glands.

LECTURE XXXVII.

On the Physiology of the Lungs.

NO subject in physiology more imperiously demands our attention and study, few subjects will better repay us for the bestowment of our time and application, than this; at the same time, I may add, none is more pregnant with speculative reasoning, and therefore requires greater caution, as well as discrimination in us, in the adoption of our opinions.

The general functions of these organs are comprehended in the term *respiration*; and respiration may be said to consist in the passage of air into and out of the lungs, through the channel of the windpipe; or, as these alternate acts have been expressed in single words, in *inspiration* and *expiration*. Now, before we inquire for what wise and important ends the process of respiration was instituted in an animal body, it will be proper for us to know how, or in what manner, its separate acts of inspiration and expiration are performed.

I have stated, (in a previous lecture,) that the parietes or walls of the chest are in part bony and in part cartilaginous, and, I may add here, in part muscular;

for not only are there, crossing the spaces between the ribs, the intercostal muscles, but there are many others, some of which are large and powerful, clothing the exterior of the chest; for the names and course of which I must refer to the lectures on the muscles. The muscles of the abdomen also I shall have occasion to advert to, as concerned in this function; but, of all others, none is so immediately interested in it as the diaphragm: it behoves us therefore to make ourselves well acquainted with the composition, attachments, and action of this last, in order that we may thoroughly understand its operation, as the principal respiratory agent.

The first act of life, in the new-born animal, is one of inspiration. In the fœtus, the cells of the lungs are empty, and in a collapsed state; but, as soon as birth has taken place, respiration commences. the cells of the lungs, then, become for the first time distended with air by an act of inspiration, which, neither the consequent expiration, nor any other subsequent effort, ever completely expels from them; so that these organs in the fœtus are, from their cells being entirely free from air, of greater specific gravity than they are ever found to be, while healthy, in animals that have once respired. In what is called healthy or natural breathing, probably no other muscular power is employed but the diaphragm. This muscle, which we find to be after death of a semispherical figure, is, when in action, reduced to a plane by receding towards the abdomen, whereby the cavity of the chest is greatly augmented in the longitudinal diameter. and this appears to be all that happens in ordinary, moderate inspiration. But in the human subject it is contended by some authors, that the intercostal muscles contribute to this

act. They are unquestionably muscles of inspiration, for they have the power of enlarging the cavity of the chest from side to side, by elevating the ribs, and, at the same time, carrying their arches outward, and dilating the intercostal spaces; were I however to venture an opinion on this subject, I should say, that they are seldom or never employed unless the inspirations happen to be deeper or quicker than they are in common, tranquil breathing. And, with regard to the horse, I am still more disposed to doubt their action in undisturbed respiration—in a state of rest; and particularly as the chest of this animal, in his domesticated state, is seldom free from the restraint of a girth or surcingle, which must of course tend to prevent its dilatation. Another set of inspiratory muscles are those that pass between the spine and ribs above, and between the ribs and scapulæ upon the sides; all of which have more or less power, by abducting and separating the ribs, to dilate the thorax. But, it is only in certain disturbed states of respiration that these auxiliaries are employed; as, when the action of the diaphragm is impeded, or inspiration becomes quick and laborious, either from violent exertion, or from disease: if, for example, a horse, having distended bowels, be galloped hard, or, as it is called, *blown*, he will instinctively employ these collateral powers; on being pulled up, you will see him standing with his fore legs directed outwards, in order that he may more effectually exert his serrati magni, by making his shoulders fixed points, and abducting his scapulæ as much as possible from the ribs. Need I add, now that his spine is fixed too, he will likewise employ his superficiales, transversales, and levatores costarum, as well

as his longissimi dorsi. And he will avail himself of the action of these muscles with considerably greater effect, if the girths be slackened after exertion: a practical hint I need not give to those who are in the habit of training. The same thing is evinced in horses laboring under acute pneumonia: they rarely or never lie down, in order that they may fix their spine and shoulders, and withless difficulty expand their chest.

Expiration is rather the result of the cessation of action in the afore-mentioned muscles, than one of muscular agency itself; though there are muscles of expiration, as well as muscles of inspiration. Inspiration being completed, a relaxation of those muscles that have dilated the thorax ensues—I might perhaps have said, to be consistent, of the diaphragm, which again resumes its convexity within the cavity of the thorax; this is not however altogether a natural consequence of its own relaxation, but is in part the effect of contraction in other muscles. In speaking of the diaphragm in action, I said that it receded towards the abdomen. Now, it is obvious that no retrocession can take place without some displacement of the viscera of that cavity; for they (like those of the thorax) completely fill it, and are therefore in contact at every point with the diaphragm. Being compressed, then, by the muscle during its action, or rather protruded by it against the abdominal muscles, these parts of the walls which are soft and yielding, give way—admit of extension: hence arises the swelling of the belly at every inspiration, which, when evident to the common observer, is vulgarly expressed by the phrase, "heaving of the flanks." Thus far regards the act of inspiration; and now the action of the diaphragm having ceased,

that of expiration begins. The abdominal viscera, no longer impressed by the diaphragm, cease to press against the abdominal muscles, which, being now on the stretch, are already excited to contract, in order to recover from their extension: this they effect by gradually compressing the bowels, which find an easy return into the hollow of the chest, in consequence of the diaphragm being relaxed and ready to resume its original shape. If the ribs *have* been carried outward, and separated during inspiration by the intercostal or other muscles, they return, in expiration, to their places as soon as those muscles have ceased to act, moved by their own ligamentous connexions, but principally by their cartilages, which, from being somewhat twisted by the abduction of the ribs, now re-act upon them by virtue of elasticity. The working or heaving of the flanks then, so remarkable in quick or embarrassed breathing, consists in the alternate actions of the diaphragm and abdominal muscles: by attention to their motion, we are not only enabled to form an opinion of the healthy state of the lungs, but oftentimes to give a correct diagnosis of the nature of pulmonary disease.

The lungs, though of themselves passive organs, follow the motions of the chest, varying their volume and figure so as to maintain a constant and close apposition with its walls; they are therefore expanded in the act of inspiration, contracted in that of expiration. That organs should have motion which themselves possess no muscular power, may appear, at first view, somewhat enigmatical; the phenomenon, however, will admit of ready explanation as soon as we have considered the circumstances under which they are placed. In the first place, we know that the lungs are expansi-

ble bodies, and that they may be readily increased in volume by inflation; and secondly, we are aware that they are everywhere in contact with the walls of the thorax; if, then, the cavity becomes enlarged, it follows that, unless these bodies move too, there must be a vacuum between them and its walls; a state, we know, that cannot possibly exist where the surrounding air can exert the least influence; at the same instant therefore that the diaphragm recedes, air insensibly enters the trachea and bronchial tubes, and expands the air-cells: indeed, were it not for this influx of air to restore the equilibrium, the pressure of the atmosphere upon the body would counteract the dilatation of the chest altogether. Moreover, this influx of air is further promoted by the rarefaction of that which is already contained in their cells; the effect of the communication of heat to it, and of some little expansion probably of the cells themselves; but the *primum mobile* is the retrocession of the diaphragm and the consequent tendency to produce a vacuum. The fact of the collapse of the lungs the moment the chest is penetrated, may be mentioned here in elucidation of what I have just stated: no sooner is air admitted into this cavity than the pressure and counterpressure of the atmosphere are equal; and therefore any expansion of them can no longer be maintained *. During the expansion of the

* Though this is the common scholastic interpretation of these phenomena, it has been shaken of late by some experiments of Dr Williams', of Liverpool, who has shown, that air admitted into one side of the chest, or into both cavities of it simultaneously, (of a dog *will not collapse the lungs*, provided the animal is allowed unrestrained the use of his respiratory organs. He says, that one lung possesses for a time, if inspiration be carried on by the other, inde-

cells, the pulmonary vessels are extended, and enlarged in calibre, thereby affording a more free passage to the blood; a contrary effect ensues during their contraction, for these vessels are then more or less compressed, and perhaps contorted at the same time.

Respiration, though ordinarily an involuntary function, is at all times under the subjection of the will, so that an animal may increase or diminish it at pleasure; and there are certain acts voluntarily performed by means of it, which tend more or less to interrupt its regular operations: such are coughing, neighing, snorting, &c. *Coughing* consists in a sudden and violent expiration, by which air is thrown with such rapidity and force from the lungs and windpipe into the mouth as to occasion that loud and familiar sound; for, observe, although in common respiration no air can pass into the mouth, yet does it happen in coughing from the depression of the larynx, which accompanies that act. *Neighing*, which may be said to be the voice of the horse, is a peculiar set of tones produced by a quick succession of expirations, during which the sound becomes variously modulated in its course through the chambers and tortous passages of the nose. *Snorting*, on the contrary, is a sonorous, protracted, and fearful inspiration.

So far I have considered the physiology of these organs in respect to what may be termed their *mechanical* functions; *viz.* the motions of the chest, and the expansion and collapse of the air-cells, consequent

pendantly of the muscles of inspiration, a peculiar motive power, the source of which he does not pretend to explain. *Annals of Philosophy.*

upon the ingress and egress of air: I shall now take a view of the *chemical* phenomena, as they have been called; under which may be classed the changes that the blood undergoes during its pulmonary circulation, and those that the respired air sustains in consequence thereof.

When on the blood, I drew attention to the remarkable difference of color that existed between that contained in the pulmonary artery, and what circulated through its corresponding veins, and I remarked that this change took place in its course through the lungs; a change of such vital importance to the animal that its omission but for a very short time will terminate in death. So intimate being the connexion between life and respiration, it is not to be wondered at that physiologists have, ever since the discovery of the circulation, and more particularly of late years, zealously prosecuted their investigations on this subject; and though, with the aid of chemistry, much useful knowlege has been elicited by experiment and observation, still do we (and probably ever shall) remain ignorant of what this relation consists in. In order to pursue a regular track in describing these phenomena, together with the most plausible theories that have been offered, from time to time, in explanation of them, it will be first necessary to say a few words on the properties of common or atmospheric air.

Chemists have demonstrated, that the air we breathe is a compound body—that it consists of three airs or gases, the names and proportions of which are as follow:—twenty-seven parts of *oxygen gas*, or vital air, seventy-two of *nitrogen gas*, and one of *carbonic acid gas*. Of these, oxygen is by far the most important,

inasmuch as no animal can exist without its presence; so far indeed does its vital influence extend, that it is an indispensable agent in vegetation: moreover, no inflammable material can burn in its absence; and hence it has been emphatically styled "the supporter of combustion," as well as of animal and vegetable life. Notwithstanding its indispensability however for the support of life, no animal can live long in oxygen alone: if you compel a dog to respire this gas in a state of purity, he will die from excessive stimulation of the system; though life will be preserved longer by a given quantity of oxygen than by an equal one of atmospheric air. But, if the air be deprived of its oxygenous component, either by combustion, or by prior respiration of it, it will be found to be incapable of supporting animal life, or even further combustion. These facts are sufficient of themselves to prove the indispensable service of oxygen in the respiratory process.

Let us now inquire what demonstrable changes the air undergoes in consequence of being respired. Numerous and complicated have been the experiments, vague and unsatisfactory the conclusions, that have been handed down to us on this subject; and it is only since the commencement of the brilliant era of modern chemistry that physiologists have arrived at any approximation to accuracy and truth. By a multiplicity of the most ingenious and conclusive experiments, chemists have proved that the oxygen of the air is diminished in quantity by respiration, though the volumes of the inspired and expired airs are not materially altered; they have also ascertained, with tolerable precision, the quantity of oxygen consumed under ordinary circumstances, during a given time, by a hu-

man being. It would be remote from the design of these lectures to enter into a detail of the experiments that have led to such conclusions; let it suffice to remark here, that about twenty-six or twenty-seven cubic inches of that gas, at the temperature of 50° of Farenheit, have been found to be consumed by a man every time he breathes; and, if the quantity of air taken into the lungs of a man at every inspiration were compared with that inhaled by a horse, or any other animal, and a reference made at the same time to the consumption of oxygen by the former, estimates not very incorrect might be formed probably of the consumption of vital air by animals of various species and sizes. There are certain difficulties attending this computation however, even in the human subject; for it has been ascertained, that less oxygen is consumed at a high than at a low temperature; and that during digestion, or exercise, its expenditure is something greater.

With respect to that constituent which makes up the chief bulk of the atmosphere, the nitrogen, although it will not support either combustion or animal life, yet it is believed to be of itself perfectly innoxious when respired. Indeed, it does not appear to receive any alteration whatever from respiration; for, if we examine the expired air, we find that the nitrogen is in the same state and quantity in which it existed previously to having been breathed *.

Not so, however, with the remaining ingredient of the air, the carbonic acid gas; that always differs

* Dr Edwards, of Paris, from some late experiments, believes that nitrogen is both absorbed by the blood, and discharged from it during respiration.

in its relative proportions in common and respired airs, and is, if breathed alone, speedily fatal to animal life. If an animal be confined in a vessel filled with this air, its life will be quickly extinguished; though there are some writers who contend, that, if this gas is of that kind which is formed by respiration, it is not of itself deleterious, but proves destructive of life in consequence of the deficiency or total absence of oxygen. Whether this be strictly true or not, carbonic acid is a product of respiration; inasmuch as it is expelled, in a considerable quantity, from the lungs at every expiration. From the most accurate analyses of the expired air of animals, it has been found, that carbonic acid gas is produced in an equal proportion to the oxygen that has disappeared; so that if the nitrogen remain unchanged and wholly unconsumed, during respiration, and the formation of carbonic acid be in pretty exact ratio to the loss of oxygen, it follows that the volumes of the inspired and expired airs cannot materially differ.

One great end that respiration appears to serve in the animal economy, is the ejection of carbon or charcoal from the system, through the medium of the lungs; to what amount this takes place in so large an animal as the horse, may probably be roughly estimated from knowing, that in a common-sized man it is computed that about eleven ounces of carbon are eliminated from the blood in the course of twenty-four hours. With regard to the consumption of oxygen, it is now generally believed, that what has disappeared of it, is wholly expended in the formation of carbonic acid gas, and that none, no more than of the nitrogen, is absorbed by the blood.

Let us now inquire if any, and what changes are produced in the blood by respiration. I have already had frequent occasion to notice the change of color as one, and I would wish to regard this as only significant of some other, and important alteration in the composition of that fluid, connected with the support of life; but, strange to say, our experimental chemists have subjected both venous and arterial blood to the most cautious analyses without having been able to detect any difference whatever in their chemical composition. I have stated, that no part of the air suffers diminution in being breathed but the oxygen, and there is reason to believe, from the known composition of the carbonic acid which is formed, that the whole of it is expended in the production of that gas; consequently there can be no absorption of oxygen, as was formerly supposed, nor conversion of it into aqueous vapor, by combination with hydrogen, emitted from the venous blood, as was taught some few years back by the celebrated French chemist, LAVOISIER. For expired air always holds in solution a proportion of aqueous vapor, which, in its ordinary rarefied state, is imperceptible; but, if from any cause it is condensed, a steam in the breath becomes at once apparent: hence it is that we can see the fumes of the breath on a frosty morning. In the human subject, many experiments have been made with a view of ascertaining the quantity of aqueous vapor expired in a given time: the accounts, however, of different writers have been so very discordant and unsatisfactory that I shall not hazard one here. Whether this vapor be the product of evaporation of secretion from the surfaces of the air-cells and bronchial tubes, or whether it flow at once from the mouths of exhalents,

still remains doubtful: for my own part, I feel inclined to side with them who maintain the first of these opinions *.

I shall now endeavour to shew, that the change of color is really the effect of the exposure of venous blood to the influence of oxygen gas. One of the most familiar proofs of it, is the well known difference which the exposed and unexposed surfaces of a clot of blood in a blood-basin exhibit: the former is of a bright red or scarlet color; the latter of a very dark modena red or black hue. We have nothing more to do however, to effect a change in these colors, than to invert the coagulum; in a short time, that which was black will acquire the scarlet dye, while the under surface will slowly exchange its florid hue for the dark red or venous one. But it is found even, that if a portion of blood contained in a bladder be exposed to an air containing oxygen, a similar effect will ensue, though the sides of the bladder intervene; and if it be thus suspended in a vessel of pure oxygen gas, the result will be still more striking. But what heightens the interest of these experiments, and makes them so conclusive and instructive to us, is the newly discovered fact, that carbonic acid gas is actually formed or disengaged during the change. Here, then, are experimental results closely bordering upon the phenomena witnessed in respiration: for we are to remember, that the blood in its passage through the lungs

* "The surface from which the pulmonary exhalation is given out, is equal, if not superior in extent, to that of the skin; it is thought that the quantity exhaled is as great. These two secretions are supplemental to one another; when much water passes off by the pulmonary exhalation, the cutaneous is less, and *vice versâ*."

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does not come into actual contact with the air, the parietes of the pulmonary vessels—if not the membrane of the air-cells too, being interposed: like the blood in the bladder, it evinces the influence of oxygen through these transparent membranes, in taking on the arterial character, and in liberating a quantity of carbonic acid gas. It has been and still is, indeed, a subject of dispute, whether the carbon discharged within the lungs is emitted through the sides of the pulmonary capillaries, (which according to some are not more than one-thousandth part of an inch in thickness,) or whether it is an animal excretion, and as such poured forth upon the membrane lining the air-cells. This is far too nice a point for me to enter into the discussion of, though I have thought it my duty to make mention of it here, in order to complete this summary view I have taken of the principal phenomena of respiration, and the theories in explanation of them which I consider to be the best received at the present day. It would be straying from my original design to prosecute this enticing investigation farther; I shall therefore take up the remainder of this lecture with the consideration of a subject that has generally been held to be inseparable from it.

On the Production of Animal Heat.

By animal heat is meant, that temperature which animals possess and preserve above or below that of the medium in which they live, a temperature which, in the superior classes, suffers but little variation under every vicissitude of heat and cold, compatible with the maintenance of life itself. This natural temperament in man, is so constant, equable, and perpetual, says

BLUMENBACH, that variety of constitution causes it to fluctuate but little, even in the coldest climate, and under the torrid zone. There are some species of animals whose natural temperature is so little above that of the medium in which they live—so inferior to that of the higher classes, that they have been distinguished as *cold-blooded:* of this nature are fish, and the various tribes of reptiles and insects.

To Dr. CRAWFORD are we indebted for a great variety of facts which tend to prove that respiration is the source of animal heat; an opinion, till lately, so uniformly and generally received by the physiologists of the day, that they have not hesitated to ascribe this operation to the lungs, as one of the most important ends connected with their economy. The explanation of this process, according to the theory of that celebrated physician, I now purpose to give in the abstract.

In the first place, we are to understand, that atmospheric air, or the oxygen of it, (for that is the only part we have to do with here,) has in its composition a quantity of *caloric* or absolute heat *, of a portion of which the process of respiration deprives it. That this is the case is satisfactorily proved by a nice examination of common and respired air, as to their chemical composition, and the actual quantity of caloric that each is capable of containing; therefore, in pursuance of this fact, if it be proved that a part of the oxygen is appropriated, in the manner I have described, to the formation of

* What is meant by *caloric*, is, that substance (regarding it as material) to which matter owes its state of fluidity: water, for example, only differs from ice, in containing more caloric, and steam from water in possessing a still greater quantity of it.

nished absorption of caloric is accounted for. But with regard to those animals that live in a cold atmosphere, the converse of this will, of course, take place, not however, that it is necessary for them to breathe quicker under such circumstances, or even to take in larger quantities of air, as some have imagined; for it is found by experiment, that the whole quantity of oxygen taken in at any single inspiration is never consumed: only so much of it disappears as is required for the immediate purposes of the animal economy. Independently of this consideration, however, more air is actually inhaled, consequently more oxygen, in cold than in warm weather; for if equal volumes of cold and heated air be weighed, the former will be found to be specifically heavier than the latter, a proof that the supply itself of heat is greater at a low than at a high temperature.

Having detailed some of the principal facts connected with the production of animal heat, let me now cursorily point out the mode in which the process is supposed to be carried on. Blood, charged with carbon, which it has received in its circulation over the body, having entered the capillaries of the lungs, and there being exposed to the influence of atmospheric air, disburthens itself of this matter, which flies off in the breath in the form of carbonic acid gas, by combining, for that purpose, with a sufficiency of oxygen. Now, it is the discharge of carbon that prepares the blood with a fresh capacity for caloric, and it is the union of this carbon with oxygen that, at the same instant, causes the evolution of caloric, in consequence of the capacity of carbonic acid gas being inferior to that of oxygenous, the production of heat therefore, and the ca-

pacity of the blood to receive and retain it, are consequent and almost simultaneous operations: and upon these two phenomena it is, according to our present theory, that depends the generation of animal heat.

Caloric, thus supplied, is evolved, as sensible heat, during the circulation of the blood to every part of the body. Dr. CRAWFORD imagined, that it was only given out in the capillaries; but subsequent experiments render it highly probable that it is also liberated in the trunks. Thus it is, then, that an animal is warmed; thus it is, that he is enabled to preserve a degree of heat superior to that of the inanimate matter around him. But, though caloric is also disengaged in the larger blood-vessels, it is in the capillaries that its diffusion is greatest, inasmuch as in them the blood is exposed to a comparatively larger surface of solid; it is, consequently, in the latter more especially that the blood undergoes the change from the arterial to the venous character, and loses its capacity for caloric in proportion as it grows dark and viscid from the absorption of carbon. In this way then, a heat, varying somewhat in its degree in the higher order of animals, is maintained in all of them: in man it rarely exceeds 98°. in a state of health, but is frequently much lower in the exterior parts; but in quadrupeds, in the interior of the body, the thermometer will rise one or two degrees above 100°. of Farenheit; and in birds, not unfrequently six or even eight.

By some curious and very interesting experiments, it has been proved that a human being can survive, and even endure for a certain time with impunity, an atmosphere heated to a degree much superior to that of the body itself. Dr. FORDYCE, Sir JOSEPH BANKS, and

some other gentlemen, had chambers so constructed that they could heat them to a very high temperature, and, after having tried successive augmentations, at length entered one heated to the excessive pitch of 260°, and remained in it for a time without experiencing much inconvenience, although they were naked during some part of the experiment. The heat was so intense that they were afraid to touch the metallic buttons upon their coats; and both eggs and beefsteaks were dressed in the course of their venturesome exposures. Now, under these circumstances, Dr. CRAWFORD states, that the lungs, instead of furnishing the animal with heat, become a medium by which his body is kept cool; an operation the doctor explains by saying, that the evaporation from their internal surface will carry off the excess of artificial heat, and leave the arterial blood actually much cooler in its return to the left side of the heart: so that in truth, now, the blood, instead of imparting heat to the different organs of the body, will absorb it from them, during its circulation.

Though Dr. CRAWFORD appears satisfactorily to have unravelled the principal phenomena of respiration, still it is probable, from some interesting experiments lately published by Mr. BRODIE, that we have much to learn in regard to the generation of animal heat. By decapitating animals, so as to destroy all communication between the brain and the lungs, Mr. B. has found, although respiration can be so performed artificially that the usual chemical changes take place in the blood during its course through the lungs, that the heat of the animal gradually diminishes, and even more rapidly than if no such artificial process were carried on

a circumstance he refers to a succession of blasts of cool air being thrown into the lungs. From which fact, substantiated by a repetition of experiments, Mr. BRODIE is of opinion, that we should rather attribute animal heat to the nervous energy than to any chemical alteration in the properties of the blood. The respiratory function, itself under the influence of vitality, is certainly requisite to the production of animal heat; but the evolution of it appears to be the result of nervous energy, imparted to the blood, through the medium of the vessels through which it circulates.

LECTURE XXXVIII.

On the Diseases of the Lungs.

THE most destructive and insidious diseases to which both men and horses are obnoxious in this climate, are those that originate within the cavity of the chest. Of the two principal organs contained therein, the one, by its propulsive power, circulates the blood; the other forms an animal elaboratory, where certain chemical and vital changes are wrought in that fluid, to render it fit for the several purposes for which it is distributed over the system. The diseases of the latter, to which I especially allude here, form a subject of intense and peculiar interest to the veterinarian; for, regarding the horse as the slave of man, if his *wind* be organically impaired, he is useless to his possessor: he may be blind, lame, farcied, and even glandered, and yet continue, in some measure, serviceable, but no sooner has his respiration become constitutionally embarrassed than he is found to be incapable of undergoing further labor, in which state he either lingers out a painful existence, or ends his days, a wretched spectacle, within the walls of a slaughter-house. Prior to entering on the consider-

ation of the various forms in which these maladies present themselves, I shall inquire under what circumstances pulmonary disease in general is generated; and how we may best preserve the animal, in his domestic state, from its insidious and dangerous attack.

Horses, before they are stabled and broken, are seldom or never affected with disease. No quadruped, within our domestic circle, enjoys sounder health, none by his natural habits tends to preserve it more, and none has stronger restorative powers than the horse; when taken from his native fields, however, as no beast is so kindly treated and so abused by man, so no one is equally subject to disease in all its various forms, but, above all, to disease of the lungs. Keeping this plain but important truth in view, let us inquire what are the obvious changes in the circumstances and habits of life of this animal, when caught up from the field and housed for the first time. *Temperature* presents itself as the primary one: there are but few days in the year in this climate, in which the temperature of an ordinary stable does not exceed that of the external air; and the colder the season is of course the greater is the contrast between them. *Food* makes another important change of condition: instead of the green herb of the field, with such occasional variety as his haunts might have furnished him with, art now culls for him provender, the best of its kind, and either spreads it before him in luxurious profusion, or sparingly supplies him with barely sufficient for his sustenance; the kind of food, perhaps, is less worthy of notice than the mode in which it is given to an animal that until lately has helped himself *ad libitum* from the salubrious herb and

pure spring of the forest. *Exercise*, which the colt has been used to take unconsciously, as it were, in his quest after food, is now given according to the convenience or caprice of his master, in a mode and degree probably alike deviating from what is natural to him. Lastly, the horse exchanges the pure atmosphere of the open field for the tainted one of the stable, and though no animal naturally more abhors the stench of his own excretions, nor can with more acuteness perceive their pestiferous effluvia, yet is there not one that we have domesticated that we compel to live in more noisome situations.

To one or other of these changes of condition may be referred the causes of disease in horses: not to dive into the depths, however, of this general investigation of them, which would lead us from our present object, I shall proceed at once to point out what the exciting causes are of diseases of the lungs. Seeing that, in a state of nature, the animal is not the subject of pulmonary disease, we cannot attribute it to any individual agent to which he is then equally, if not more exposed: if, for example, cold * produced it, pneumonia ought to be more prevalent at this time; so, also, by parity of reasoning, we may argue that it is not heat, for many horses in hot climates are exposed to a higher degree of heat in their natural than in their domestic state. Alternations of these conditions, however, appear to be powerfully influential in the production of this disease; a fact indeed which a knowledge of the

* The word *cold* is used here to express a comparative low degree of heat: in this view, I would regard *cold* and *heat* as distinct agents, it will save periphrasis as we proceed.

physiology of the lungs may lead us to understand, since no part of the animal is so much under the operation of changes of temperature as the mucous membrane lining the nose, windpipe, and air-cells, with which cold or heated air must actually come in contact at every inspiration, in a manner I have before pointed out. If we couple this physiological truth, then, with the exciting cause of inflammation in general, need we feel surprised when we find that this membrane, of all other parts, suffers from the operation of such agents?—that, in other words, it is so disposed to take on inflammatory action every time an animal is taken from a cold to a hot atmosphere? Were this fact not too long established in practice to render many, by way of proof, necessary here, instances enough might be brought forward, both in the human subject and in horses, to illustrate and confirm it: soldiers during a campaign in the cold season of the year, to which they have turned out from long-accustomed, warm, and comfortable quarters, never experience any thing like the illness (and seldom any of a pulmonary nature) they do on re-entering into barracks, and as for horses that are similarly exposed, after having been pampered up in excellent stables, they contract hardly any disease until they are once more warmly stalled. What men are commonly the subjects of pneumonic affections? Not those who are much exposed, and badly housed, but such as inhabit comfortable dwellings, and are well clothed and fed: so it is with horses; we do not often see pneumonia in agricultural horses; seldom or never in such as live on commons, or in open yards; but in gentlemen's studs, hunters, racers, and coach and post horses, nothing is more common than catarrhal and

pulmonic attacks. You are not to imagine, however, that either a man or a horse can be taken from a very warm situation and suddenly placed in an intensely cold one with impunity, any more than, because you have an infallible remedy for a disease, you can give any quantity of it without injury; for, though sudden changes from cold to heat are prejudicial, heat of itself is not more injurious than cold, and were not the animal previously exposed to cold no evil would arise from his subsequent exposure to heat. In this light, cold is sometimes viewed as the *predisposing cause* of inflammation.

With respect to the change of food, there cannot be a doubt but it must dispose, from its being the chief cause of plethora, to general diathesis of system, and, so far, it contributes to the production of pneumonia, or any other inflammatory affection. Horses that are well fed, and but little worked, are frequently the subjects of this disease, and, though some may assert that this is wholly attributable to the nature of the atmosphere they breathe, I must still contend, that pampered horses, like robust men, are, *cæteris paribus*, more liable than others to inflammations of every kind.

Exercise, at least, laborious and unprepared-for exertion, is another and an obvious source to which we may trace this disease. There is none of us who has not witnessed attacks of pneumonia from hard riding, or hard driving: in fact, in the hunting season the occurrence is a very common one.

Lastly, can an atmosphere, of a mean temperature, contaminated with the animal effluvia generated in the decomposition of the excretions, and the carbonic acid gas cast off with the expired air, be considered of itself

as an excitant of pneumonia! Now, as heat is a pretty constant constituent of such an atmosphere, it appears, at first view, difficult to say, whether it be to one or the other that we should ascribe the excitation of disease: from numerous facts and observations, however, collected by practitioners who have paid attention to this subject, with many of whom I have held converse, I feel inclined to believe, that pneumonia is rather the product of heat than of animal poison. There have been situations occupied by great numbers of horses in which these poisonous agents may be said to have been present without the co-operation of heat; and where, though the prevalence of other diseases sufficiently evinced their morbid influence, pneumonia was hardly ever seen. In averring thus much, I allude more particularly to what happened in the practice of the veterinary surgeons (of whom I was myself one) who did duty with the army in the Peninsula. Both in Portugal and Spain, most of the stables, or places used as stables, were dirty and filthy in the extreme, being either without any pavement at all, or so badly paved that there were no sewers to drain off the urine. In these situations, both horses and mules, of which the number was considerable, during the march, contracted farcy, glanders, and mange; but very few of them, inflammation of the lungs, and simply, I believe, for this reason—that the stables, though unwholesome from being so foul, were cold, either from their size, or from dilapidations, and consequently did not subject the animals to severe and sudden changes of temperature. Another argument, that just occurs to me, against the opinion that pneumonia mostly originates from breathing a polluted atmosphere, is this—that it is, in itself, a malady free

from any malignant character; whereas the diseases, generally speaking, that are generated by such agents, exhibit more or less malignancy in their nature: such are glanders and farcy; and, in the human subject, typhoid, gaol, and putrid fevers.

Concluding then that heat and unprepared-for exertion more especially act as the *exciting causes* of pneumonia, it does not require much penetration to discover by what means we can best protect the animal from its invasion. Of late years, with this view, Professor COLEMAN has recommended the stables of the several cavalry barracks in Great Britain to be ventilated. With one part of the principle no man who has ever understood the subject can be at variance; if alternations of cold and heat be the cause, that which tends to lessen the severity of these changes must be, in the degree in which it does so, the preventive; and if this be the object, I consider it is as an undeniable one, but if it extend to the *purification* of the atmosphere, from what I have stated before, I think that its salutary influence, so far as regards *pneumonia*, is highly questionable *. Ven-

* By the bye, there is a fault that has been committed in all the cavalry stables that I have seen by those who have put MR COLEMAN'S plans in execution, which it will be as well to avoid in future. The upper vent holes, which are for the purpose of giving exit to heated air, are made by taking out one or more of the bricks nearest to the ceiling or roof, over the horse's head, and are consequently *horizontal*. Now, for ventilation, the best direction for the aperture is the *vertical*, seeing that air when rarefied is always carried *upward*, but this is objectionable from its admitting wet, &c. upon the horse. I therefore recommend that the aperture be made *oblique*, which still gives free vent to the current of heated air, and at the same time shelters the stable both from wet and wind. For I may remark that, in some stables, the horizontal opening gives passage to a current of

tilation then is one mode, and one in which consists the grand secret of keeping horses healthy; for, although we may not agree as to the *modus operandi*, or mode in which a temperate and pure atmosphere preserves health, we shall all concur in opinion regarding the fact, that this, and this alone, is the chief preventive of disease. He that has clean and cool stables, will have a healthy stud; and the converse of this will never fail to engender disease. Above all other considerations then, in taking the colt from his natural state, it behoves us to guard him from the vicissitudes of cold and heat, and to keep him in an atmosphere as pure as that of which we have just deprived him. Why is it that so many young horses die during the autumnal and spring seasons of the year? Or why do so many, after they have left the breeder's possession, fall victims to pulmonary disease in the dealers' stables of the metropolis?—or why have such numbers been lost to the cavalry, whose stables formerly were very badly constructed? I am aware that it may be said, and with great truth, in answer to the first of these questions, that horses at these fatal seasons are changing their coats, and that they are naturally weaker, and more likely to prove unhealthy, and that food, exercise, and a foul atmosphere are also operant in the production of disease; admitting all this, however, I still maintain that heat, or at least the sudden change from cold to heat, is the chief pernicious agent. Horses of any age, but above all young horses, should never be exposed to a heated air: they may be warmly

cold air from without, instead of escape to the heated air from within.

clothed, and even with advantage kept in moderately warm stables, but they ought never to respire a hot and stimulating atmosphere.

The next circumstance to be attended to in order to preserve the health of a horse recently domesticated, is exercise. Compelling this animal at once to perform such exercise as comes under the denomination of *work*, is surely subjecting him to the invasion of disease, and of disease, most probably, of his organs of respiration: hence the old observation, "a young horse never ought to be sweated in his exercise." Numberless horses, not only young ones, but of all ages, are from want of consideration on the part of their owners, killed in this way in the course of the year. A person purchases a young horse of a dealer, who most likely has had him for some weeks, during which time the animal has been getting *fresh*, as the dealer calls it—*i.e.* he has been pampered with all possible care, fed as if he were put up to be fattened for the butcher, and little, or not at all, exercised: suddenly the horse, by way of trial, is made to perform, by his new master, what he calls, and to another would have been, but moderate work, but what to this is excessive exertion, and the consequence is, that the animal is attacked with pneumonia, and dies in the course of eight and forty hours. It is of the utmost consequence therefore to attend to this circumstance, if the horse be young, we cannot be too gentle with him in regard to his exercise, for at this period he is totally unfit for work. For the first week, he should be walked out for an hour every morning; during the second week, this may be repeated in the afternoon; and during the third, the time of exercise may be prolonged to an hour and a half or two

hours. At the expiration of a month, he may be trotted, and this pace should be entered upon slowly and increased with the same caution as his walking exercise has been: but care should be taken even yet not to make him sweat. Though a horse newly purchased of a dealer is one whose age indicates that he is able to work, still, in consequence of his having probably been kept long in a state of inactivity, will some such regimen be required to put *him* even in actual condition for hard work: hunting a horse with others under such circumstances, is like matching a man nursed in the lap of indolence to contend with a pugilist in hard and continual training.

Food, though a secondary measure, is one that is not to be entirely disregarded. If the horse be young, and but lately brought into the stable, or recently purchased from the breeder, his food ought to be of that kind which is easy of digestion, and, at the same time, not too nutritious: it is far better to feed him partly on bran and hay chaff* than to supply him with a full allowance of corn; you may give him half-a-peck of oats, mixed with twice that quantity of bran or chaff, in four feeds, in the course of the day; the object being to prevent any approach to plethora from high-feeding. After a time, the proportion of corn may be augmented, and the bran and chaff gradually withdrawn; until, at length, he may be allowed three or four feeds of corn, or oats and beans, in the course of the day, as his exercise becomes more laborious, and his condition appears to require it.

* Hay chaff should be cut from the best sainfoin, lucerne, or clover.

Inflammation of the Lungs.

Inflammation of the substance of the lungs, technically called *peripneumony*, at the same time that it is one of the most destructive in the catalogue of veterinary diseases, is one of almost daily occurrence, it is therefore a duty incumbent upon us to make ourselves well acquainted with all that is known respecting it.

Its attack is often so sudden that it gains considerable violence before the horse is even suspected to be unwell; but in other cases it will be preceded by regular febrile symptoms. A shivering fit, succeeded by a transitory heat of skin, and dryness of the mouth, though the extreme parts of the body generally maintain their coldness, is a very common precursor, accompanied with dulness, loss of appetite, and accelerated pulse. At length, the respiration becomes short, quick, and painful; not exactly such as is symptomatic of common irritative fever, nor such as is characteristic of broken wind or thick wind: in acute pneumonia the flanks work with great celerity. I have often known the respiration to exceed the pulse in frequency, and every heave is manifestly attended with exertion and pain; at the same time, there is a degree of regularity in the working of the flanks that marks the presence of inflammatory action. The pulse also runs on with great quickness—90° or 100°, but is commonly not remarkable for strength; indeed, in many cases, it is the reverse, and in some is indistinct or altogether imperceptible at the heart. The animal soon grows chilly again, his coat stares, and his ears and legs have an icy coldness. He stands with his fore-legs stiffened and stretched out, his neck extended, his nose protruded, every now

and then turning his head round to his side, working and puffing with his expanded nostrils at every laborious and painful heave he makes. His countenance—his eye, to the observant practitioner the index of his sufferings, bears visible signs of distress, and makes an impressive though silent appeal to us for relief. He never lies down for rest—even at night. Cough is rarely present *.

Should the breathing, after an elapse of about twelve, or from twelve to twenty-four hours, become oppressive, the pulse upward of 100°, and feeble, or grow indistinct or altogether imperceptible, both at the jaw and heart, the skin remain cold, or be bedewed with a clammy sweat, the mouth have an icy cadaverous feel, and the animal, in a paroxysm of pain, often lie down and momentarily rise again, we may conclude that the case is a hopeless one: if blood be drawn at this period, it will exhibit the darkest venous (nearly black) hue, be thick and viscid, and flow with much tardiness from the vein, forming clots upon the hair or side of the blood-pan as it slowly trickles down the neck.

By the accounts that have been given of this disease in horses, I am led to believe that it has not been viewed in its proper light; for we are to remember that, in these cases, it is the bronchial—the nutritive vessels of the organs that are primarily affected, and that the pul-

* It may be a matter of surprise that peripneumony, which is not of itself a very painful disease in a man, should be described as so distressing in a horse, but, the fact is, that, to speak correctly, it is pneumonia, and not abstract peripneumony, that is here pourtrayed. I know of no difference myself in the symptomatology of pleurisy and peripneumony.

monary are only secondarily so. In hepatitis, though the functions of the vena porta are disturbed, it is the hepatic artery that is primarily and principally engaged in the inflammation, and, for similar reasons, the bronchial and not the pulmonary, are the supporters of inflammation in peripneumony. Bearing this in mind, the different phenomena of the disease will admit of satisfactory developement. The respiration is short and quick at first in consequence of the tumor and preternatural irritability attendant on inflammation in this, as in any other part of the body; the tumefied and infiltrated parenchyma compresses the smaller bronchiæ and the air-cells, so that not so much air can be admitted at each inspiration as in health; and from the same cause that the air-tubes and air-cells are compressed, the pulmonary vessels are also diminished in calibre, and the blood which, from them partaking of the pulmonary excitement, is now determined to them also in undue quantities, finds its passage with difficulty through them; the consequences of this are, engorgement of the lungs themselves, but small, though frequent supplies of blood to the left side of the heart, and that not duly oxygenized; to which, and to the sympathetic irritability of the heart itself, we may ascribe the frequency of the pulse, and the absence of strength in it. But the right side of the heart, on the contrary, has too much blood, resulting from this pulmonary obstruction, and this is the source of that pulse which is called the *oppressed*, as well as of its occasional irregularity, in which condition the action of the heart is feeble from over-distention. hence it is that the pulse, at first weak or imperceptible, so often acquires freedom and strength from a well-timed vene-

section. The skin is cold for three reasons:—first, because the left side of the heart, not having its ordinary supply of blood, cannot propel the requisite quantum to the extreme parts of the body, secondly, because the blood itself has not undergone the full degree of change—hence also the livid hue of the membrane of the mouth, and thirdly, because so much more blood than in health is carried by the pulmonary as well as the bronchial arteries into the lungs, in the substance of which it is so much longer detained. The horse extends his fore legs outward in standing, and refrains from lying down, in order that he may, with all possible effect, exert his serrati magni, and other muscles running from the shoulder and spine to the ribs, he straightens his neck, protrudes his nose, and dilates his nostrils, that he may facilitate the egress and ingress of air.

I have already said so much about the exciting causes of pulmonic disease, that it cannot be necessary but to name them here. From exposure to cold the sudden vicissitude of heat, ranks pre-eminently above any other, over-exertion stands next in the list; sometimes the disease appears to arise spontaneously.

Pulmonary disease runs its course now and then with surprising rapidity. I have known a horse to be attacked with acute pneumonia, and to die from it in the space of seventeen hours, and it is by no means uncommon for it to prove fatal on the second or third day from its onset. Ignorance of this fact has led to the institution of many law-suits, and to some oppressive judicial arbitrations for horse-dealers: *e.g.* a gentleman purchases a young horse, warranted sound, and the next day or the day after, rides or drives the ani-

pilots to a successful result. Empiricism, a great obstacle to advancement in all medical science, and the bane of good fellowship among the members of either profession, has extended its influence in an especial manner to the treatment of pneumonia. I feel it a duty, therefore, to connect with the opinions I am about to promulgate, that I have no motive in recommending them to notice but the progression of that art which it has fallen to my lot, by the publication of its principles, to labor in establishing, in this country, upon the basis of science. In the first instance, and the earlier the better, we must draw blood. Seeing, at once, that the disease is an acute attack of pneumonia, it is not even necessary to examine the state of the pulse, we may proceed directly to make a large orifice in the jugular vein, or one in each of them if the case is urgent, and take away from six to eight or ten quarts of blood, according to the size and strength of the horse; unless he shew symptoms of faintness during the detraction, in which case we ought instantly to pin up the vein. Were we to be governed solely by the state of the pulse, we should not bleed in many of these cases perhaps at all; for, as I observed at another time, the pulse is often imperceptible at the heart, and weak and indistinct at the jaw; this, however, arises from the gorged state of the lungs and consequent plethora of the venous system—a condition that venesection directly relieves, so that if we examine the pulse, we shall frequently find that it is actually rising—growing distinct at the heart, and beating with more freedom at the jaw, while the blood is flowing. Sometimes the pulse will become strong and bounding from bleeding; but this may be considered as a sign that too sparing a quantity of blood has been

drawn, and therefore one that should induce us to recur to the operation; for we must take care not to cease bleeding as soon as we have removed this sanguineous fulness, but to continue it until we have reduced the action of the circulatory system down to a state of direct or absolute debility.

After the first bleeding, we are to be guided chiefly, as to the expediency of repeating the venesection, by the pulse: at the same time, we are not altogether to disregard other symptoms, and particularly the state of the respiration; if that continues unabated, and the pulse is undiminished in frequency and still strikes the finger sharply, it is our duty to return to the operation. Probably, this second phlebotomy may be required in the course of four or six hours from the first; the quantity drawn however should be less -from four to six quarts being in most cases sufficient; and whatever evacuations may be indicated afterwards, ought to be likewise reduced—about three, and even two quarts being as much as can generally be taken with benefit: all this, however, must depend so much upon the course and severity of the symptoms, and the general condition and strength of the patient, that it would be bordering on quackery to pretend to prescribe in a lecture minutely in regard to venesection.

Having bled the horse, what is the next step to be taken? Professor COLLMAN, when I was at the College, used to recommend the pupils to turn their patients out from stables ever so hot, and from being accustomed to clothing ever so warm, into the open air, even in the midst of winter, relying on the benefit resulting being in proportion to the severity of the change; Professor PEALL, on the other hand, advises us, to

rub the surface of the body if it be cold until it becomes warm, and to cover it well with woollen clothing, especially in cold weather.—*Medio tutissimus ibis* *.

That cold debilitates the force, and in many of these cases the frequency of the circulation or, in the words of the Schools, operates as a "direct sedative," I admit; also, that it may prove a valuable remedy to the veterinarian in the course of his practice; but that this sudden exposure to it has a salutary influence in horses laboring under pneumonia, it is my duty to say that my experience does not (nor does the experience of any Veterinary Surgeon that I know) verify: the medical records of the Royal Horse Infirmary, the practice in which has been more extensive than that in any other British veterinary establishment, decidedly condemn such treatment.

Though I am averse to turning the animal out, I recommend that he should be put into such a situation as will admit an abundant and a continual supply of fresh and cool air, where he can turn and put himself into any posture that may be most agreeable to him, with which view, an airy *loose box* of all others is the best place. At the same time that I take care to afford him pure and cool air to breathe, I take the precaution to have him clothed, not only to keep the surface of the body warm, but, if possible, to excite perspiration; and whether the medicine I am in the habit of giving, or the clothing does it, I generally succeed in promoting that smooth, glossy state of skin which is the well-known effect of augmented cutaneous exudation. In order to generate

* I believe that Professor Coleman has relaxed the severity of this treatment. The practice adopted now at the Veterinary College, is to turn the horse into an open shed

warmth in the extreme parts, a hood should be worn, and the legs rubbed and bandaged with flannel.

The medicine I have been in the habit of giving for twelve years, and upon which I repose now with considerable confidence, is white hellebore. To describe its operation, perhaps I cannot do better than advert for a moment to the use of ipecacuanha, under similar circumstances, in the human subject. That substance is a nauseant, a vomit, and a sudorific, and is highly serviceable in pneumonic affections, from the effects it manifests in lowering vascular action, and promoting diaphoresis and expectoration. Much in the same way white hellebore appears to operate: it excites nausea, and will, if carried farther, produce efforts to vomit; it diminishes the force and frequency of the pulse with singular efficacy; it abates all the inflammatory symptoms; and it influences, I myself believe, the action of the perspiratory vessels, though I must confess I have never seen actual sweating produced by it. Although it is a remedy of the most active kind, and one whose operation demands unremitting vigilance, it is one that we have most completely under command. I commonly give it in the dose of a scruple or half-a-dram, and repeat it every four, six, or eight hours, according to the urgency of the case *. During its exhibition we are to be continually on the watch for symptoms of nausea—such as, the horse all at once evincing extreme dulness, hanging his head in or under the manger, and frothing a little at the mouth; the pulse, however,

* ℞ Veratri Rad. Pulv. ℈j vel ℥ß.
Pulv. Flor. Anthemidis ℥ß.
Syr. Simpl. q. s. ut ft. Bol. tertia vel quarta quàque hora exhibendus.

which will be found to have sunk by this time to an unexpected degree in force and frequency, will almost always give us warning of such a state, before these symptoms have made their appearance, so that we need not carry the medicine thus far unless we are desirous of making a greater impression. Having once affected the pulse, I recommend that the dose be diminished, given at longer intervals, or suspended altogether, according to the pressure of the case—continuing or recurring to its use only at such times as the pulse and respiration appear to demand. To this account of the beneficial operation of hellebore, I have much satisfaction in adding the testimony of so scientific a practitioner as Mr. William Goodwin, who informs me, that he has administered hellebore extensively during the last winter in His Majesty's stud with eminent advantage.

Let me observe here, that purging is a pernicious practice; and that I have rarely seen aloes given, even in small or nauseant doses, without being productive of mischief. Not many months ago, *carbonate of ammonia* sprung up into notice as a "never-failing remedy" for pneumonia. Being anxious to know to whom we were indebted for this *extolled* innovation, I learnt that it originated with a horse-dealer! I was rejoiced to find it was not a Veterinary Surgeon. The discovery was certainly worthy of the man, and when he dies I would have inscribed upon his tombstone, *Hic jacet auctor hujus argumenti!*

The next part of the treatment consists in the use of blisters. I have heard it said, that blisters by increasing the pulse do mischief, and that towels ought to be preferred because they produce a deep-seated, and not a superficial inflammation. This last is an argument

that I must confess I am unable to sift scientifically; and as to blisters increasing the frequency of the pulse, I can safely aver that it will not happen during the exhibition of hellebore. For my own part, nothing would induce me to relinquish the use of blisters; by them, I believe to have mitigated the poignant sufferings of many a helpless brute, and to have contributed not a little to his ultimate recovery: I own that this may not admit of very ready demonstration, but if I may be allowed even to reason analogically, it is no more than natural to maintain such an opinion. Ask a man wincing from the lancinating pains of a pleurisy, whether a blister applied opposite to the part affected has relieved him!—or ask a surgeon whether he would insert a seton in the side, with a view of exciting counter-irritation with the utmost celerity and effect in acute pneumonic inflammation!—for the cases are precisely similar. Blisters should not be exhibited until we have reduced the force of the circulation by the use of the lancet, and the frequency of it by the administration of the sedative or hellebore ball; a repetition of them will be necessary in order to keep up a continual irritation in the skin, with copious discharge and subcutaneous effusion. I always make use of the infus. lyttæ, so that there is no occasion to trim off the hair: from four to six ounces are sufficient for both sides, which should be repeated in the course of six or eight hours if no effect shall have been produced. As to rowels, indeed, they do little or no good during the acute stages of this disease, and for two reasons: one is, that before the rowel acts it frequently happens that the horse is dead, or is so far relieved that you consider him out of danger; the other, that, if they do take effect, the discharge from them in

the course of a few hours is so small, and the inflammation they give rise to so circumscribed, that they are not at all calculated to afford relief in these cases. One blister, in my opinion, is worth in point of efficacy half-a-dozen rowels *.

Some practitioners recommend us to apply blisters to the legs; but I am not yet quite satisfied how far the practice is beneficial, and therefore I shall not take upon myself to sanction it. I have seen it adopted in a great number of cases, but it is somewhat difficult to determine with what benefit to the animal; thus much however I have remarked, that it does not, if the case be treated with hellebore, quicken the pulse from irritation; and it most unquestionably must be regarded as a propitious symptom, when the legs become warm and swollen. If blisters to the legs be admissible under any circumstances, it is when those parts are extremely cold, and have resisted ordinary measures to restore a kindly heat in them, such as the use of flannel bandages, friction, &c. It is odd enough that those who have all along been most hostile to the use of blisters to the legs as well as the sides, should have advised us to plunge these parts in hot or boiling water: this, to me, like the preference given to a rowel because it is productive of a *deep-seated* inflammation, is very unintelligible medi-

* Professor Pratt closes his inquiry into the comparative efficacy of rowels and blisters, thus:—"The experience however of many years, has completely satisfied my mind, that all the advantages that can be derived from rowelling in this disease, may be obtained in a more cleanly and less offensive manner, through the medium of blisters."—"And I would, therefore, recommend the blistering of the chest and brisket of the animal, as well as the sides, in preference to the insertion of rowels in those parts." *Loc. cit.*

cal logic ; as I cannot therefore be expected to enter upon the discussion of what I do not pretend to understand, I shall wind up the point at issue (and in doing so concentrate my opinions) with this remark—that warmth of the extreme parts is a desirable but not a primary object in the treatment, and that we may make use of any means to fulfil this indication so long as they be not found to be productive of constitutional irritation.

LECTURE XXXIX.

On the Chronic Diseases of the Lungs.

I OBSERVED in the last lecture that pneumonia, when it resisted the timely and efficient employment of suitable remedies, was apt to run into the chronic stage, and that then it either terminated in hydrothorax, which is its most frequent mode of destruction, or gave rise to the formation of tubercles: hepatization of the lungs may also be the effect of this form of disease, but I am inclined to regard that as a more common consequence of acute peripneumony. Having in a former lecture treated of hydrothorax, I shall now make a few remarks on the tuberculous state of these organs.

Should a protracted peripneumony, especially in an old horse, degenerate into such symptoms as follow, or should he enjoy intervals of apparent health and at length return with such a relapse, we may have suspicions that the lungs are, or are becoming, tuberculous: more or less quickness and difficulty of breathing, a short cough, a small, quick pulse, defective appetite, a gradual decline of condition, and with it, of strength and spirits, coat dry and harsh, and some appearance in the course of the disease of farcy or glanders, and if

the horse coughs up and discharges from the nostrils a clotted purulent matter, and that discolored and fetid, vomicæ also are probably present.

The tubercles commonly met with consist of little, whitish, round, hard substances, inclosed in compact cellular cysts; when they are seated near the surface, they feel like so many hard knots in the substance of the lung in passing the fingers over the pleura. At first there are but very few of them, and they are distantly lodged from one another, but in the course of time they grow very numerous, and are dispersed throughout the parenchyma of one or both of the lungs. At length, they grow soft, become converted into caseous substances, and ultimately degenerate into ulcers, which produce a fetid sanious matter that is mixed with the pus and mucus of the bronchiæ and cast off through the nose. Not unfrequently we meet with large, white, soft tubercles; whether which be formed by the coalition of those now under our consideration, or whether they be a distinct species, I am at present unable to determine.

In other cases the parenchyma is studded with little red tubercles, which, when cut into, have a liver-like aspect. They vary from the size of a pea to that of a marble. The first change these appear to undergo is one also of mollification, during which they turn of the color of the darkest venous blood; the second, a conversion of the black part, which originates and spreads from the centre, into a yellowish white matter, like cheese; thirdly, they ulcerate and produce an ill-digested pus, similar to that of the white tubercle, which is likewise discharged through the bronchiæ.

We are not to suppose however that tuberculous

lungs are always manifested by outward signs of disorder many old horses are thus affected who, though they may be "touched in the wind," do a certain sort of work very well, and preserve their condition under it In some instances tubercles lie dormant in the pulmonary tissue for a number of years, and are at length by an attack of inflammation or some other cause roused suddenly into action In other cases, their nature appears to be involved in what we call *glanders* and *farcy*, in relation to which I shall postpone their consideration until I have occasion to treat of those maladies.

There is one other inflammatory affection of these parts, which, as it more frequently assumes the chronic than the active type, I shall speak of here, but for which (as it has, with some other diseases, escaped the pens of writers on farriery) I am at a loss for a name—at least for one that will be recognised by the profession: probably, when we shall be favored with our new nomenclature, it will come under the denomination of

Bronchitis.

It is, in fact, essentially the same disease as *peripneumonia notha* of the human subject, a name that has been very properly proposed to be banished to make room for the one above *.

In the generality of cases bronchitis originates in a common catarrh, along with which, if it be mild, it may run its course without our knowledge of its presence, at other times however the respiration and pulse, and the expectoration of muco-purulent matter by the nose and, when the animal coughs, by the mouth, plainly

indicate to us that the disease has reached the lungs. The generality of veterinary surgeons to whom you may talk on this subject, will tell you that catarrh has produced or terminated in *inflammation of the lungs*—meaning what I have described under that head, *peripneumony*; but a little reflection will show them that they are in error, and, if that will not, a little dissection will convince them of it.

If, then, you meet with a horse who, in addition to the ordinary symptoms of catarrh, has a more frequent respiration than natural, and an occasional wheezing noise from which he is relieved by coughing and expectorating a considerable quantity of mucus or muco-purulent matter, accompanied with febrile disorder, you may presume that he is the subject of bronchitis; though, with the exception of the wheezing noise, (which by the bye is not always present,) I know of no sign by which you can distinguish it from cynanche trachealis. This however is a point of no moment; for, barring the parts chosen for the application of counter-irritants, I know of no tittle of difference in their treatment. Venesections, small but often repeated—aperient doses of aloes, in combination with hellebore and turpentine *, with which I sometimes conjoin calomel †, —blisters—rowels or setons—bran diet—and, some add, the linseed drink, which will certainly not be produc-

* ℞ Aloës Ext. Vulg. ʒiß.
Pulv. Veratri Rad. ℈j.
Terebinth. Vulg. ʒiß.
M f Bol Mane Vespereque sumendus donec alvus purgetur

† ℞ Aloës. Ext. ʒj.
Hydrarg. Submur. gr. x.
Rad. Veratri ℈j.
Syrupi q. s. ut f. Bol. sumendus ut supra

tive of harm, are the remedies it ought to be encountered with. For detail about regimen, I must refer to the latter part of the lecture "on catarrh," and to certain parts of that "on roaring."

To show that this is a disease that ought not to be passed over, indeed to demonstrate that it is one of importance, I need only remark, *en passant*, that what I am going to speak of is, I believe, always a consequence of it.

Thick Wind.

However unintelligible the title of this part of my lecture may appear to some, I believe it is sufficiently explicit to the horse man. The peculiar sound that conveys to his mind the idea of *thick* wind, which is only produced when the animal is put to exertion, originates in the innermost parts of the lungs. Professor Coleman attributes it to an effusion of lymph into the air-cells; I am of opinion that it proceeds from a thickening of the membrane lining or forming the cells, and continued along the bronchial passages, but the genuine, unallayed cases that present themselves for *post mortem* inspection are so few that it is not a very easy point to determine *. Thus much respecting it appears to me to be certain—that we may form a better *ratio symptomatum* out of my exposition of its nature than out of the professor's. Though the disease may, and I believe often will be found to exist in the larger branches of the bronchiæ, it is not into them that we

* A common accompaniment is hepatization of the lung, which is a great impediment to a minute examination; probably the deposit also contributes to the production of the sound, by opposing the expansion of the bronchiæ.

are to look for a rationale of the symptoms, for then calibre is too large to admit of obstruction or impediment from a thickening of the lining membrane, but into the smaller—the membranous ramifications, in which the additional thickness, though really not greater than in the large, so much diminishes the diameter of the tube that the passage of air through it is embarrassed; and it is to the impetus with which the air rushes through *them* that I would ascribe the production of the noise, called thick wind: so that it is in fact a species of roaring. I do not mean to assert that there may not be other causes for this disorder, but I believe this to be the more frequent one; and it is one which, from its nature, we certainly have but little chance of removing. This shews us then how necessary it is to endeavour to arrest, by every means in our power, the inflammation—the proximate cause of the membranous disorganization here present; and during its attack it is, and then only, that the disease can be said to be within the reach of remedy. I have stated that *roaring* even may result from this morbid alteration: my father has made a preparation from the lungs of a roarer in which there is opacity—an unnatural whiteness and thickening of the bronchial membrane, as far as one can trace it with the eye, joined to hepatization of the substance of the lung.

Unless the case was a recent one, and there still remained symptoms of inflammatory action, it would be the height of absurdity to entertain any notions of cure. Should we, under these circumstances, be called to treat thick wind, we shall mostly find that the symptoms of inflammation are ebbing fast, and that depletion cannot do much good. I would direct my views

chiefly to counter-irritation, and that should be long and unceasingly persisted in.

On Broken Wind.

Few disorders have more attracted the notice of veterinarians, in this as well as in former ages, than the one I am now going to give a description of: speculations and opinions of its seat and nature have been both numerous and discordant. It would be a waste of time, and foreign to my present purpose, to enter into an account of the many (I may say) idle conjectures that have been started regarding its nature, or of the disgusting operations and ridiculous farragos that have appeared in print for its *cure*; I shall therefore proceed at once to point out the signs and symptoms by which its existence may be known, examine the theory at present entertained of its proximate cause, and offer some remarks on the treatment of horses that are the subjects of it.

The symptoms of this disease are such as, when well marked, leave no room for doubt of its presence, so that one who has seen but two or three cases of it, will hardly ever afterwards be deceived in his diagnosis: in fact, were I to tell a horse-dealer of the metropolis, or a breeder of horses of Yorkshire, that he did not "know a *piper*," I should derogate perhaps more from his judgment than if I had questioned his knowledge on any other horse topic whatever. Two symptoms especially guide us in our decision:—the state of the breathing, and the nature of the cough, whether morbidly present or artificially produced. Expiration is comparatively long, protracted, and difficult; inspiration short, sudden, and free, the flanks, with a quivering action,

gradually contract until they exhibit that appearance called *tucked up*, then, having compressed the abdomen to the utmost, they all of a sudden expand and resume their former shape and relaxation: so that much more time is occupied in the act of expiration than in that of inspiration. To convey a correct notion in words of the cough is more probably than one ought to pretend to, though so peculiar is its sound that once heard we shall not fail to recognize it in future; it is, strictly speaking, (if any cough can be called so) *short*, at the same time feeble, and scarcely audible at a distance that a sound one would be distinctly heard: it strikes one with the idea of its having come from the top of the wind-pipe, or of having been attempted to be suppressed in the larynx: in fact, it is the very reverse of a *hollow* cough. The cough is frequently followed by a shrill sibilation, which reminds one at once of the suffering of a human asthmatic: indeed, when this peculiar sound is heard, it is as characteristic of broken wind as it is of asthma. Although cough is generally a concomitant of this disease, we are mostly compelled, in making our examination of a horse, to produce one artificially, which may be done either by putting him to any violent exertion, or by the more usual and ready expedient of compressing his gullet. Indigestion, accompanied with troublesome flatulence, is mostly a consequent disorder.

The theory of a disease consists, first, in discovering its seat, and, then, in demonstrating its nature. In this point of view, those original writers who have hitherto attempted to develope the pathology of broken wind, have, in my opinion, one and all failed. Being engaged in making inquiries about the origin of what is considered as the best existing theory of this disease, I was agree-

ably surprised in finding the following authentic account in Dr. Rees' *Cyclopædia*, by the writer of an article entitled "*Broken Wind.*"—"In the year 1795, being engaged in the dissection of a grey mare that was sent to the Veterinary College to be destroyed on account of this complaint; on opening the chest, the lungs appeared free from inflammation, being very white, and, as they appeared free from redness and increase of colour, the general concomitant of disease, we were led for a while to consider the lungs as not the seat of the disorder, as others had done. (For several of the pupils were present at this dissection). On cutting into their substance, no inflammation was perceivable, on examining them more closely, we observed a small bladder or vesicle on the outside of the lungs, in the external investing pleuritic coat; this was conceived by some who were present to be a tubercle, and that tubercles might be the cause of the broken wind. Suspecting, however, from its appearance, that it was not solid, but contained air, it was punctured, and it immediately subsided. This instantly suggested to the writer of this article, that the lungs were actually in a state of *emphysema*, or that air was contained in a state of extravasation in their substance, and which not only seemed evidently the case in this instance, but we have since fully verified it by examination and dissection of a considerable number of cases of broken wind, and found that it is the constant appearance. This extravasation of air in the substance of the lungs is perhaps occasioned by a rupture of the air-cells, as suggested by Mr. Coleman at that time, unless it is formed in them, and thrown out by some morbid operation of the blood-vessels, as sometimes happens in the intestines and vagina, for the exact way in which this em-

physema arises has not been yet ascertained. It fully explains the cause of the white appearance of the lungs, the membranes being separated and divided by air lying between them partially admit the light, also the puffy appearance they make, and the crackling noise they give on their being handled. all admit of a ready explanation by this discovery, and so do the symptoms which attend the disorder, for the common air escaping, from a disease or a sudden rupture of the cells, into the membranes composing the lungs, thereby compresses and obliterates more or less the natural cavities destined for the reception of the air, and thus occasions the effort we observe to overcome this obstruction, and which naturally induces the appearances we have described as the symptoms attending this disorder: it also accounts for its incurability, and the oppression which a full stomach occasions. As the extravasation proceeds, the complaint gradually, or sometimes suddenly, increases, so as to be insupportable to the animal; and at length being quite useless, he is necessarily destroyed. In some cases, the disease, without much increasing, may exist for many years, and till the horse dies from other disease or age. This white appearance of the lungs it is that had deceived so long those who had been led through curiosity to examine the lungs in this complaint; it being so unusual to see any part in a state of disease more delicately white than in its healthy state, and singular it is that the extravasated air should not bring on the inflammation and destruction of these organs."

To the writer of this paragraph then (who, if I mistake not, is well known as a veterinary author) are we indebted for the fact, *that the lungs in broken wind are emphysematous*, and for the suggestion, *that they contain*

EXTRAVASATED *air;* to the professor, for the opinion, *that the extravasation is occasioned by a rupture of the air-cells.* For my own part, I must acknowledge that my opportunities of inspecting the lungs of horses broken-winded, have been but few; as far as my examinations have gone however, they confirm this emphysematous state of lung; of which the vesicular appearance of the pleura (a very general accompaniment, I believe) affords, at least, presumptive evidence; and as the secretion of air is a point in pathology that yet seems to admit of some doubt, it appears to be but fair to conclude with the professor, that the cells are ruptured. But what will these pathologists say, if I produce to them two cases, neither of which was broken-winded, and yet in them both the lungs were emphysematous *?

* The first is that of a bay horse, that was the property of W HARVEY, Esq. of Eltham. After a brisk run, late in the day, on the 9th of November, 1822, with the Surrey fox-hounds, this horse was taken so ill on the road home that Mr HARVEY had four quarts of blood drawn from him. On his return home he grew worse, showed symptoms of pneumonia, with which prevailed obstinate constipation of the bowels. This was overcome however, and his breathing had become so tranquil, and the pulse had sunk so much, that hopes were entertained of his recovery up to the morning of the 14th, when he relapsed into his former state of restlessness and pain, and died at four o'clock p. m. On dissection, the spleen was found preternaturally large, though of healthy aspect. The liver was pale. The cavity of the pericardium contained a pint of fluid. The right lobe of the lungs was sprinkled with large, white, soft tubercles, was of a pink color, *and presented several large bladders of air which raised the pleura from its surface.* Mr KING, Surgeon at Eltham, was present when the horse was opened. Mr HARVEY, who is well known in the Surrey field as one of the most forward and resolute riders in it, has assured me that he never met with a better hunter or *a better winded horse.*

Now, in these cases, whence was the air derived? It certainly cannot be said to have been *extravasated* air, for there was no breach whatever, either in the air-vessels or air-cells. And yet the lungs in the last case had the same pale, bloated aspect, the same crackling, emphysematous feel, that they have in broken wind!

The next was a case admitted into this infirmary on the 5th of February, 1823. The symptoms indicated disease of the chylo-poietic organs, but of which of them, or of what nature, it was very obscure. At one time the liver was supposed to be the chief seat of the disease; at another, the mesenteric glands were thought to be affected. His pulse ranged from 50 to 60; but he had no apparent derangement in the functions of respiration. Latterly, he grew thin, wasted away day by day, and died reduced almost to a skeleton on the 1st of June. The examination of his body excited more than ordinary curiosity, and was conducted with special nicety and care. The mucous coat of the stomach exhibited those marks of *patchy* inflammation which it does from the application of poison. The peritoneal coat of the larger intestines was begirt with similar broad red patches. The liver was the chief seat of disease—its structure altogether changed, and its color, as well as that of the bile, a dull or dirty green. Twenty ounces of water were measured out of the pericardium. So perfectly bleached were the lung and its pleura on the left side that, on a superficial view, they appeared to contain no blood whatever: when contrasted with the left lung, which had the usual healthy aspect, it exceeded any thing of the kind I had ever seen before. *Both the right and left lungs presented several bladders of air upon their surfaces, two or three of which were as large as apples cut in halves.* The pleura was cleanly and completely detached by air from the lung; the connecting cellular membrane having been absorbed. The integrity of the lung in these places appeared to be unimpaired. Inflation of the lung to extreme distension produced no visible alteration in these bladders, although the experiment was several times repeated. On minute examination of them, the air appeared to have proceeded from the parenchyma, for, by compression, they could be rendered lax, although no air was found to escape externally.

If the fact, *that the air-cells are ruptured in broken wind*, now one of thirty years' standing, rest upon the firm basis of actual and repeated examination and experimental inquiry, then the inevitable conclusion is, that these cases were of a different nature, and, as such, I believe, have hitherto had no parallels given publicity to. But how are we to reconcile this theory with what I have now to state on the authority of my father, whose opportunities to investigate morbid structure have been exceeded by very few in the profession?—and that is, that he has found the lungs of some broken-winded horses *free from any emphysema whatever*, or other appearance indicative of ruptured cells. To which I may add, that Mr. Sewell has framed a theory on the subject which has a totally different ground-work.

With a view, however, of throwing some additional light on the subject, I shall for the present wave these facts, and adopt the prevailing theory of the day; this will enable me to inquire what sort of a *ratio symptomatum* can be deduced from it—how far it tallies with the causes and symptoms of the disease, and its effects upon the system, and how far it bears us out in our present mode of treatment. Blumenbach says, (speaking of human lungs) that if air be forcibly thrown into them, the air-cells will be ruptured; but I am not aware that any writer makes mention of such a case happening during life; though there are some related of vomicæ and ulceration of the cells giving rise to emphysema. But, if we are to consider this disease as a rupture, *per force*, of the air-cells, it appears to me that this theory will, by no means, serve to account for many of the facts connected with broken wind. Instead of the disorder manifesting itself on a sudden, which it ought

to do, if it consisted in a lesion or rupture of the cells in consequence of some violent effort in breathing, its approach is gradual; it is generally long preceded and prognosticated by a dry husky cough; hence it is very common to say, that such a horse has a *broken-winded cough*. Horses that are greedy feeders, that consume daily large quantities of gramineous provender and water, and that are irregularly worked, are the subjects of this disease; in a word, such as feed grossly and take exertion upon a full stomach: neither post horses, nor coach horses, have it so frequently as carriage horses, farm horses, and hackneys, because the former consume but little hay, are duly watered, and are regularly worked and kept in wind. This fact has been brought forward in support of rupture; the horse, (say they) not being able to breathe with his usual freedom, makes some violent efforts in one of which the air-cells become lacerated. Now, let us examine this point—let us first inquire what are the circumstances most favorable to a rupture. It appears to me, that, to burst the cells, the air should rush in with unusual celerity and impetuosity, and the chest should be in a state to admit, at the time, of the fullest expansion of the lungs; at least, this would undoubtedly be the most effectual method of lacerating them in the dead, and I cannot see why it should not be in the living body. As far as distension of the belly can operate, it would appear to me rather to counteract this effect than to favor it; for, if the diaphragm cannot recede with its usual freedom (and we know that the auxiliary inspiratory powers—the muscles attached to the shoulder, cannot act while the fore legs are in motion) how is the chest to be dilated to an extraordinary degree, or the

lungs to be preternaturally expanded?—ergo, how is this deep and violent inspiration to be made? But, the reverse of all this will not infrequently happen:—broken wind has been known to occur in the stable, and in the strawyard; and I have been credibly informed that horses have been taken up from grass with the disease upon them, that were in health when they were turned out: these horses, most assuredly, will glut their stomach and bowels prodigiously, but, then, they are not very likely to exert themselves afterwards of their own accord so as to burst the substance of a healthy lung. Again, admitting that the air-cells are ruptured *per force*, I cannot see why Nature should not, in some of these cases at least, renew the integrity of the lung. I cannot conceive that rupture can happen without extravasation of blood, as well as air, which blood might in some cases prevent the effusion of more air; at all events, one would think that adhesive inflammation would ensue, that the extravasated air would be absorbed, and as the restorative powers of the horse are great, I repeat I am at a loss to understand why some of these horses do not recover; which, it is universally known, none ever do. For these various reasons, for my own part, I am by no means satisfied with the present theory of broken wind.

On the other hand, it must be acknowledged that this mode of reasoning serves us very well to explain the short and sudden inspiration followed by the comparatively long and tiresome expiration, for, as soon as the air has left its cells and become diffused through the parenchymatous texture, the animal is compelled to make use of great expiratory efforts—to draw his flanks in considerably more than he did before, to squeeze this air back into the ruptured cells, which

it must all enter again before it can be expired, but having once, though perhaps imperfectly, effected this, the vacuum formed afterwards by inspiration seems to approach more to a perfect one than even that in health, for the air now rushes in with greater celerity than ever. Professor COLLMAN generally prefaces the exposition of his opinions on this subject, by saying, that those who named the disease *broken* wind, have left us reason to conclude that they were acquainted with its nature—that they knew, in fact, that there was something *broken*. But I view this in a different light altogether; for, if we only remember one of the predominant symptoms of the disease, which shall be nameless here, and then advert to the vulgar meaning attached to the phrase "to break wind," we shall have, I think, quite as good, if not a better derivation for this appellation; for, in those days, the farriers were not much given to morbid anatomy!

Last year, Mr. CHERRY, happening to have a strikingly well-marked case of broken wind in his infirmary stables, was kind enough to inform me that he would have the horse destroyed any day I would be present. Accordingly, no sooner was life extinguished than we removed the lungs, trachea, and larynx from the body, and submitted them, as yet steaming with vapor, to close and careful examination. The general aspect of every part was that of perfect health; only the lungs were paler (being of a light pink hue) than they generally are at this time of life—eight years old. The pleura was every where in apparent health but in those places in which it was elevated, by air underneath, into vesicles; there it was opaque and whitish, which, at first view, might have led one to believe that these

vesicles were so many white tubercular eminences. The vesicles were most numerous and conspicuous upon the *anterior* lobuli, but both lungs had, in every part, a crackling, emphysematous feel, and the air they contained could be readily made to traverse their substance by compression. They were remarkably buoyant in water; particularly the anterior lobuli. When inflated, the air appeared to distend their parenchyma; but, what was very remarkable, *it neither increased the number of the vesicles, nor enlarged them that already existed*. After inflation, the whole lung became still paler and crackled more when squeezed with the hand: this Mr. CHILDRY thought arose from the rupture of more cells; I had however, and still have, my doubts on that point. The bronchial and tracheal membranes, though of their natural color, were *much thickened* *; the membrane covering the arytenoid cartilages was likewise *thickened, and studded with little hard papillary eminences*. There was no alteration in the *form of the trachea*. I shall leave this case without remark, and the subject, as it stands, without further comment: I wish to withhold my own opinions until I shall have had time and opportunity to ratify or falsify them by further observation and experiment.

About the treatment of this disease I have but little to say. Did I believe that there was lesion of substance, and that this lesion was the effect of a violent effort in breathing however, I certainly should prescribe for the case if recent, and I conceive with some prospects of benefit, for, if the torn parts were glued toge-

* I should like to know if this is a constant appearance—if it be, I think it will throw much light on the pathology of broken wind

ther again, (and I must repeat, I cannot divine why they should not be in certain cases under proper treatment, in the same way in which other wounds of the substance of the lung are,) the only mischief that would ensue probably would be the agglutination and solidification of a few air-cells: the extravasated air, like the air in emphysema, would, I should think, be speedily removed by the absorbents. But, here all medical treatment is out of the question; a horse once broken-winded is ever so; in other words, we have no cure for broken wind. Not being able to remove we must endeavour to mitigate the complaint; for broken-winded horses, unless they are inveterate cases, may by proper management be rendered very serviceable for a variety of purposes: indeed, they are occasionally hunted under a judicious regimen with less inconvenience to them than we might *a priori* be led to suppose.

It is by attention to the *feeding* and the *exercise* of such a horse that we shall enable him to do his work with comparative ease—without those painful sobs for breath which, to the ear of his humane rider, most loudly call for a relaxation of exertion. Not that there is any thing especially applicable to broken wind in the mode of feeding I am about to recommend; for it ought to be adopted in all cases of defective or embarrassed respiration, and with some horses would be practised with advantage even in a state of health. The object we have in view in putting such a horse under a prescribed regimen, is at all times to keep his stomach and bowels free from distention, but, above all, to take care that these parts are not in a state of fulness when he is put to work; for, if they are, the diaphragm, from the pressure of the stomach and colon against it,

cannot recede to the required extent, and the consequence is difficult and laborious breathing as soon as we begin to make the animal exert himself. Give him then but little hay, and give him that little at night, after he has done his work; feed him mostly on corn, for that contains more nutriment than hay, and occupies a much less space. I do not see the necessity for depriving a broken-winded horse of water in the unfeeling manner in which it is commonly done; any considerable quantity should certainly not be given when he is about to go to work; but if he be watered frequently—four, five, or even six times in the course of the day, and his provender itself be made wet, he will not take large draughts; and when we come to learn the short time that water remains in the stomach, we shall see less reason for enforcing this insalubrious practice. Broken-winded horses always work best when fed with green or succulent food; carrots, parsnips, Swedish turnips, mangel wurzel, and (some say) potatoes, are esteemed particularly wholesome for them, and they are so, and for these reasons:—because they are very nutritious, are of light digestion, very mildly laxative, and contain much water; so that the animal drinks but little, and what he eats remains but a short time in the stomach and bowels; a circumstance that greatly tends to his relief. Indeed roots, such as I have mentioned, I feel inclined to believe, would prove by far the preferable food for these horses; for their digestion is never good, as the flatulent state of their bowels evinces, as well as the roughness of coat and lowness of condition many of them exhibit, though this last effect may be in part attributed to the imperfection of the respiratory functions. If oats

are given, they ought to be bruised and wetted, and if hay is, it ought to be of the best quality, (of meadow,) and that cut into chaff: sainfoin, lucerne, and clover, unless green, I would never feed a bad winded horse with.

At times, when the animal appears to suffer from a return of symptoms (and this fact proves that broken wind continues its progress, whether it consist in extension of rupture or not) small doses of aloes alternated or conjoined with smaller ones of calomel, will prove very beneficial. I have also practised small venesections, when the relapse was at all violent, with decided advantage. Mr. SEWELL is in the habit of giving digitalis, in these cases, in doses of half-a-dram or a dram, and in one horse whom I saw under its influence, the breathing was very much tranquillized by it. as may be anticipated, however, the relief is only temporary.

Before I quit this subject, I cannot forbear exposing to censure that disgraceful and disgusting practice of making an *artificial anus*, with a view of relieving the flatulent condition of the large intestines—the *farmers' broken wind*. Sometimes the sphincter ani is completely divided, and the unfortunate beast becomes a loathsome spectacle from not having the power to close the anus and retain the fæces. I am not aware however that it is practised at present; at least I hope not wherever the Veterinary College has a representative.

LECTURE XL.

On the Heart.

THE heart may be defined to be, an involuntary, hollow muscle, contained in the thorax, the use of which is to circulate the blood.

It is placed about the centre of the cavity of the chest, between the divisions of the lungs. Its base, which is opposed to the bodies of the 4th, 5th, and 6th dorsal vertebræ, is suspended from the spine by the principal venous and arterial trunks of the body, its apex, which is inclined to the left side, hangs loose and unattached, within the cavity of the pericardium, nearly in a line with the sternum, and points to the diaphragm, with which at every expiration it must come in contact.

Before the heart is removed from the thorax, I shall make some observations on the membrane that surrounds and conceals it. This is named the *pericardium*. This membrane, which is formed into a loose sac, has not the same outward aspect as the pleura:—it is white and opaque, it is also thicker in consistence, and stronger than that membrane. It is composed of two layers, intimately united by cellular tissue. The external one is dense and fibrous, is possessed of the

chief strength of the membrane, and is attached below by several ligamentary cords to the sternum and tendinous part of the diaphragm, and above to the roots of the large blood-vessels at the base of the heart, upon which we lose sight of it altogether: the sides of it are clothed and additionally strengthened by the adhesions of the pleuræ. The internal layer is fine and cellular, exhibits inwardly a smooth, polished surface, and appears to be similar to other serous membranes in its intimate texture and organization; it not only lines the external layer, and gives a covering to the roots of the large blood-vessels, but is reflected from them upon the heart itself, to which it forms a close and complete tunic: so that the heart is absolutely out of—above the cavity of the pericardium; in fact, it is situated precisely the same in regard to this membrane, as the human head is in a double night-cap.

The arteries of the pericardium secrete into its cavity a pale yellow, serous fluid, denominated the *liquor pericardii*: this lubricates the contiguous surfaces of the bag and preserves them against the effects of friction.

The pericardium confines the heart in its proper place, sustains the reciprocal action of it and the lungs and prevents their interference, and protects the organ from surrounding impressions. I shall now detach the heart, and take it out.

The form of the heart is that of a cone; but its shape and general appearance are so familiar to every one that I shall say nothing more about them here.

This organ varies a little in size in different subjects: its ordinary weight is about six or seven pounds.

For the convenience of description, the heart may be divided into its *base*, *body*, and *apex*.

It is also said to have two *sides*, each of which contains two cavities: the two superior cavities (from having been likened to the ears of a dog) have been denominated *auricles*: the two inferior have been named *ventricles*. Their boundaries are marked externally by deep excavations, which are filled with fat; the limits of the ventricles are likewise pointed out by furrows upon the body of the heart, containing fat, continuous in substance with that which is deposited above. This fat is more abundant in old than in young horses.

The heart owes its smooth, glossy aspect externally to its thin duplicature of pericardium, which is everywhere in such intimate adhesion with its surface, and so transparent, that its parietes are too plainly demonstrable through it to require that this membrane be stripped off.

The sides of this organ, commonly distinguished by the epithets, *right* and *left*, would more properly be described, in allusion to the relative situation of their cavities, as *anterior* and *posterior*: for the right auricle forms the upper and *fore* part, turning its apex to the left side; and the greatest part of the left auricle is apparent *behind*, though its apex is also turned to the left side, and is inclined downward. The ventricles, being situated under their respective auricles, face consequently, like them, forwards and backwards. Though the auricles are essentially the same in structure as the ventricles, they differ from those parts in exterior appearance, in bulk, and in the substance of their parietes; they are of a pale red color, are very uneven, when distended, upon their surfaces, and are indented along their inferior borders; whereas the ventricles are of a dull red or deep flesh color, are smooth and even upon

their surfaces, and of themselves compose three-fourths of the organ.

The *right auricle*, generally found full of blood after death, is lined by a fine, vascular membrane, and presents internally a polished surface, the regularity of which is interrupted in places by many fleshy prominences, named the *musculi pectinati*; between which are numerous little sinuses, or *cul-de-sacs*, that, as well as the fleshy pillars themselves, vary much in size, and are most numerous and remarkable within the *appendix*, or ear-like portion of the auricle, where they form together a reticulated structure. Three venous trunks terminate in this cavity.—the vena cava anterior opens into the superior and posterior part of it; the vena cava posterior opens into the inferior and posterior part; and the coronary vein just below it. The vena azygos forms a junction with the anterior cava just as the latter pierces the auricular parietes. Between the openings made by the two venæ cavæ, there is a prominence that is usually called the *tuberculum Loweri*. There is a deep *sac* or *sinus* at the entrance of the posterior cava; and between this and the mouth of the coronary vein, a crescentic *valvular flap*, which projects half way over the mouth of the latter vessel. The right auricle has a free communication with the right ventricle by an aperture of large size, called the *auriculo-ventricular opening*.

One auricle is divided from the other by a muscular partition, denominated the *septum auricularum*; in which may be seen, when the part is held to the light, an elliptical inlet of semi-transparent membrane, crossed in places by fleshy fasciculi, which takes the name of *fossa ova-*

lis. In some subjects there is a small aperture through it, and this is all that remains of the *foramen ovale*.

The *right ventricle* is redder and considerably thicker in substance than the right auricle: like it, it commonly contains after death a large coagulum of blood. It is likewise lined by a smooth, polished membrane, and has within it numerous *fleshy pillars*, which, instead of being reticulated as those are in the auricle, are disposed longitudinally. In addition to these there are three conspicuous fleshy prominences, from their size named the *carneæ columnæ*, from which several little tendinous cords, *cordæ tendineæ*, proceed to the edges of three membranous and fibrous productions (sometimes distinguished by the name of *cortina tendinea*) that close the auriculo-ventricular opening: the apparatus altogether forms the *valvula tricuspis*. Other cords, similar to the cordæ tendineæ, but stronger than they, pass between the outer wall and the septum. The pulmonary artery emerges from the upper and back part of this cavity; and its mouth is guarded by three *semilunar valves*, which present little pouches within the cavity of the vessel: these valves consist of doublings of the lining membrane of these parts, infolding, about the middle of their loose edges, three small granular substances, described as the *corpuscula Arantii*. Opposite to the valves, three depressions are apparent in the coats of the vessel: these are named the *sinus Valsalvæ*.

The *left auricle* is smaller than the right, and has thicker parietes. It contains in general but little blood, and in some subjects none. It presents nearly the same aspect internally as the right. It has not so much of the reticulated structure however—fewer *musculi pec-*

tinati; what there is, is more strongly marked, and is principally confined to the appendix. The *pulmonary veins* terminate by four openings in the superior and posterior part of this cavity. The *auriculo-ventricular opening* is somewhat larger than that of the right side, and is rather square than round. Now, that the auricles are both laid open, the *septum auricularum*, *fossa ovalis*, and *foramen ovale*, may be distinctly viewed.

The *left ventricle*, though smaller within, is longer, and more prominent and extensive without than the right: it forms, of itself, the *apex cordis*. Its outer wall far exceeds in thickness that of any other cavity of the heart; it is thrice that of the right ventricle. Its *musculi pectinati* appear mostly upon the septum, within the apex, and under the valves. It has but *two carneæ columnæ*, but they are very bulky and project much into the cavity. Its auriculo-ventricular opening is only furnished with *two* valvular productions; in other respects the *cortina tendinea* and *cordæ tendineæ* resemble those on the right side: this valve is called the *valvula bicuspis* vel *mitralis*. The *aorta* takes its rise from the upper and fore part of this ventricle, and, concealed at its origin by the pulmonary artery on one side and venæ cavæ on the other, makes its exit close to the spine. The mouth of the aorta is shut by three *semilunar valves*, similar in formation and disposition to those at the origin of the pulmonary artery: but the *sinus Valsalvæ* are much larger and deeper. Just above two of them are seen the mouths of the *coronary arteries*. The ventricles are divided by a thick fleshy partition called the *septum ventriculorum*.

Though the heart may be said essentially to consist of fleshy fibres, a tendinous structure is demonstrable in its

body, which appears to be the common medium of attachment of its auricles, ventricles, vessels, and valves to one another. The fleshy fibres, composing the parietes of the auricles, stronger in the left than in the right, are disposed in every direction, those that form the walls of the ventricles, for the most part, appear to run longitudinally and obliquely, and, many of them, in a spiral manner. These fibres are more slender than those of other muscles, and are more intimately and firmly compacted, the cellular tissue also, uniting them, is finer, denser, and less in quantity.

The heart is supplied with blood by the two coronary arteries—the first branches given off from the aorta. Its veins pour their blood into the coronary vein, by which it is returned into the right auricle. Its nerves are derived from the cardiac plexus.

On the Physiology of the Heart.

In the centre of the body is placed the heart, by whose concentrated muscular power blood is made to flow into every part of the sanguiferous system, and perform that regular circuit which in common language is called the *circulation*. There may be said to be two circulations:—the *greater*, or that course which the blood takes over the body generally; the *lesser*, or that which it runs through the lungs only, it is usual however to consider them but as one, and to describe them together as *the circulation of the blood*.

In giving a description of the circulation, it is of little importance where we begin:—whether we consider a volume of blood as being poured into the auricles, after having completed its two separate courses, or whether we take it as it mounts from the ventricles in

order to commence another general circuit; as it is more common however to adopt the first of these methods, I shall make a beginning with the right auricle. This cavity having received a certain quantity of blood from the anterior and posterior venæ cavæ, contracts and discharges that blood into the right ventricle, which, by a similar effort, propels it into the pulmonary artery; and it is while circulating through the minute divisions of this vessel that it receives the change the nature of which I endeavoured to explain in a former lecture. From the extremities of the pulmonary arteries the pulmonary veins receive it, and convey it, through the medium of four trunks, into the left auricle: and thus is complete the lesser circulation. This cavity, being distended, empties itself into the left ventricle, by whose action the blood is impelled with considerable force into the main trunk of the arterial system, the aorta, the innumerable branches and minute ramifications of which distribute it to every organ and every part in the body. Having arrived in the extreme arterial capillaries, and served the various purposes of nutriment, secretion, and repair, it is received by the radicles of the veins, by them conducted into the larger venous branches, and at length transmitted into the venæ cavæ, anterior and posterior, by which it is poured again into the right auricle—the part whence I set out in my description.

Let us next inquire what are the particular functions of each part employed in the circulation of the blood. The uses that the auricles serve are two-fold. In the first place, they are reservoirs—they receive the blood as it flows back from the veins, and retain it until enough has collected to distend the ventricles. The importance of their office as such will be manifest to us if we but for a

moment suppose the heart to be constructed without them. Had the blood, for instance, been immediately poured by the veins into the ventricles, not only would the circulation have been subject to frequent interruptions and intermissions, but every now and then it must have stopped altogether from the stagnation of blood in the larger venous trunks, which vessels would have been very liable to rupture from over distension: in this point of view, some anatomists have regarded the auricles as mere dilatations of the largest veins. The other function of the auricles, is to contract when full and impel their blood into the ventricles. To convince ourselves that their action simply consists in this, we have only to examine their parietes, and compare them with those of the ventricles; indeed, they little exceed in thickness those of the venæ cavæ; nor was it necessary, since they are not required to exert more force than is sufficient to discharge their blood into the cavities beneath them. The systole and diastole of the auricles are perfectly synchronous; *i.e.* they receive their blood from the veins at the same interval of time, and they contract upon it simultaneously. And it follows, as a natural consequence, that the states of expansion and contraction in the ventricle will likewise be synchronous, so that when the auricles are contracted the ventricles are dilated, and *vice versâ*. When an auricle contracts, all its sides are brought nearer together, in other words, its cavity is diminished pretty uniformly in all its dimensions; so that the blood within it, has as much tendency to flow back into the veins as it has to flow down into the ventricle beneath it. Reflux however is prevented by (it is supposed) the continual undulating force that the returning blood opposes to that already

poured into the auricle, for we do not find that any valvular apparatus is at this part provided for the purpose.

The ventricles, the functions of which I shall now consider, take a far more active part in the circulation than the auricles; by some physiologists, indeed, they have been regarded as the only agents employed in propelling the blood over the body; but it is highly probable (as I have already endeavoured to shew *) that they are much assisted in this operation by the arteries. The substance of their parietes clearly demonstrates that they must take a very efficient part as circulatory agents; indeed the comparative strength of their muscular fibres lead us to believe, that they are respectively capable of exerting a mechanical force adequate to the greater and lesser circulations; but, I repeat, it is improbable, in my opinion, that they unassisted circulate the blood, or, that the blood-vessels themselves are altogether passive. During the contraction of these cavities, all retrogade motion of the blood is prevented by the valves placed within the auriculo-ventricular openings; on the right side by the tricuspid, on the left by the mitral valve; and these valves are unequal in strength in consequence of having to resist different degrees of force: the force of the left ventricle, for example, being greater than that of the right, the mitral valves and their appendages are thicker and stronger than the tricuspid.

By the powerful action of the left ventricle then, blood is propelled into the aorta, the numerous branches of which are already in a state of fulness, and con-

* In Part I. Lect. iv. *On the Physiology of Arteries.*

sequently cannot receive more blood without becoming proportionably surcharged. Now, it is at this period that the elastic power of the arteries comes into play, and assists, in a manner I have already described, in propagating the momentum given to the blood by the heart: and, as at this time the arteries may be said to be in a state of systole, it follows that their diastole is synchronous with that of the auricles, but alternate with that of the ventricles. The systole of the ventricles is supposed to occupy about one-third of the time of the action of the organ altogether.

The heart, like the arteries, is known to pulsate: by which I mean to express its beating, with certain degrees of regularity and force, against the left side of the chest. This effect of the heart's action has been accounted for in various ways, the best explanation however of it appears to be this:—that its apex is forcibly driven against the ribs of the left side, during the systole of the ventricles, in consequence of the distention of the auricles and the re-action of the large arteries immediately connected with its base, which are at this instant surcharged with blood. I have already given a detail of the variations of the pulse *, so that it will not be necessary to enter upon the subject here: all I wish at present to bring to mind is, that the pulse in health does not beat with the same frequency in various classes of animals, nor at different periods of life in the same individual animal. Estimating the standard pulse of the horse at forty-five beats in a minute, and supposing that the left ventricle expels six ounces

* Vide Lecture *On the Physiology of Arteries.*

of blood at every pulsation, it follows that two hundred and seventy ounces will pass through this cavity within the space of one minute, and above a thousand pounds in the course of an hour; a calculation that may serve to give us some idea of the extent of the disturbance which the variations of the pulse must occasion in the regular distribution of this fluid, and in its supply to organs in general, and one that will in some measure account for the derangement of the system accompanying unnatural vascular action.

Some physiologists have endeavoured to ascertain the force of the heart's action; but the discrepance of opinion apparent in their estimates, leads one to suspect that difficulties very considerable, if not insuperable, attend such an inquiry. BLUMENBACH says "the impetus of the blood passing from the heart, may be conceived by the violence and attitude of the stream projected from a wounded artery, large and near the heart. I have seen the blood driven to the distance of at least five feet from the carotid of an adult and robust man." The same author observes, that the impulse imparted from the heart to the blood is communicated to the arteries to such an extent that it is remarkably evident in those branches which can be explored by the fingers and which exceed one-sixth of an inch in diameter. The influence of the heart's action, however, is probably extended through the capillary, if not through the venous system; though the impulse conveyed to the blood in the latter is too faint, in consequence of its remoteness from that organ and the interposition of the capillaries, to produce pulsation. It has been proved too, I think, that the heart further aids the return of the blood through the veins by

suction, originating in a power of self-dilatation inherent in the auricles, which they exert at the very same interval of time that it is impelled into them by the vis-a-tergo. So that altogether we cannot too much admire the ingenuity displayed in the construction of this little organ, which, at the same time that it manifests a truly astonishing power in the propulsion of the blood, is by no means in an inconsiderable degree accelerating the reflux of it, and thus is acting at once both as a forcing and a suction pump.

The cause of the heart's action is a subject that has much occupied the attention of writers on physiology, some of whom, in too hastily taking up their positions, appear to have disregarded many of the phenomena connected with it; for my own part, without entering into the discussion of discordant opinions, or agitating unsettled questions (from which I refrain as much as I consistently can in the physiological parts of these lectures) I shall select some of the leading facts, and draw such deductions from them as appear at once the most obvious and are the best received. In the course of our inquiry we shall find that the actions of this organ are closely allied to the functions of respiration, and that upon our knowledge of the latter will often depend our ability to give an explanation of the most important phenomena relative to the former. In watching, in dying animals, the succession of contractions in the different cavities of this organ to their complete cessation, it has been found that the right auricle preserves its action longer than the left, from which circumstance HALLER designated this part the *ultimum moriens*; and it has been ascertained by repeated ob-

servation, that in cases of ordinary death the right side of the heart is distended with blood, while the left contains comparatively but little. Now, as an explanation of these facts appears to be an indispensable preparative towards unravelling the mystery of the cause or causes of the heart's motion, physiologists have spared no labor in searching for competent theories. Certainly, reasoning *a priori*, congestion on the right side of the heart after death may be said to be owing to its continuing to receive blood after the supply to the left has completely ceased; but this only amounts to speculative inference which it is incumbent on us to show the stability of by additional facts before it can be admitted as a satisfactory explanation. In my lecture "*on the physiology of the lungs*," I remarked that the blood flowed uninterruptedly through them so long as they continued in a state of expansion, but that it met with impediment and occasional obstruction whenever those organs were compressed: I may here add, that this is fully confirmed by experiment, and that the more perfect the collapse the greater is found to be the impediment. Now, the last act of life being a deep expiration, it follows that, as the blood is still urged on from the arteries and poured by the venæ cavæ into the right auricle, whence it flows into the right ventricle and pulmonary arteries, a congestion of it in these vessels must eventually take place, in consequence of its not finding its usual, ready passage through the lungs; whereas, with the left side of the heart the reverse happens—those cavities can receive but little blood, and that little they can get rid of so long as their action is maintained. But, suppose

that an animal breathed his last by a deep inspiration, and that the lungs could be maintained in a state of inflation, what would be the result then? If the impediment in the pulmonary circulation be the cause of these appearances, and that impediment consist in collapse of the lungs, the removal of it ought to be attended with some alteration, if not a total change, in them. The subjoined experiments of Professor COLEMAN's, happily and ingeniously contrived, show that these states of the right and left sides of the heart would even be reversed if the animal died with an inspiration, and very satisfactorily prove to us that compression and probably complication of the pulmonary vessels are the natural consequences of collapsed lungs.* And, not only may the distention be transferred to the opposite side, the continuance of action—the predominance of vitality may be made to transmigrate from the right to the left side, under certain unnatural circumstances; so that, in fact, the latter becomes then the veritable *animum moriens.*

We must not rest here though, by pursuing the inquiry we shall find that the action of the left side of the heart may be interrupted, by a cessation of respira-

* "If a dog be hanged or drowned, the right side of the heart will contain more blood than the left, in the proportion of about 9 to 1; in the former case, and of about 5½ to 4 in the latter. But, if the lungs be immediately, after apparent death, inflated with any unnecessary fluid, such as water, to a sufficient degree to remove the pulmonic obstruction to the return of blood through them, the left side of the heart will contain more blood than the right, in the proportion of about 3 to 2; if we suffocate the animal by putting ligatures about the windpipe, the same phenomena are observable."

Vide COLEMAN, *on Suspended Respiration.*

tion, in another way. If the lungs contain no air, or air deficient of oxygen, it is evident that none of the chemical phenomena I have so lately expounded can take place. In short, what blood finds its way into the left auricle will be blacker than that contained in the right. And that blood can and does pass through the lungs in a collapsed state, Dr. GOODWYN has proved, in demonstrating, that sufficient air always remains in these organs after death to admit of it; a fact that led this philosopher to conclude, that protracted expiration was not fatal in the way commonly supposed, but (as he imagined) arose from the left ventricle not being stimulated by black blood, and the supply of the various organs of the body being entirely suppressed. There are several facts, however, that militate against this opinion, and convince us that black blood can be a stimulus to the left ventricle. If, for example, the windpipe of an animal be tied and its carotid artery opened, though red blood at first issue, black will be ultimately ejected from it, and will continue to be thrown out for a sufficient length of time to shew that the left ventricle is acting on blood of a similar quality. In cases of suspended respiration also relieved by the ordinary means, *i.e.* by inflation of the lungs, the left ventricle must contract on black blood before it can receive any duly changed from the pulmonary veins. But in the fœtus (as will be explained when speaking of its peculiarities) the left side of the heart is actually receiving darker blood than the right, and naturally contracts upon it in the course of the ordinary circulation.

I might go on in this way to combat the opinions of others without being able to show after all why the

action of the heart ceases soon after the suspension of respiration. Mechanical obstruction to the blood's passage through the lungs, though it may tend to weaken or retard the heart's action, does not appear to be the immediate cause of its cessation, for so long as the contractions of the right side are maintained, sufficient blood probably can still pass to the left auricle to support life. It would appear rather to be the want of a due change in the blood—the deficiency of that which preserves the irritability or vitality of the heart; for it is admitted that, although the left side of the heart is susceptible of excitement from black blood, its action is weakened under such circumstances, and can only be invigorated again by the blood receiving its proper change. From a vast number and variety of experiments, made with a view of throwing light upon this interesting but abstruse subject, we are perhaps warranted in drawing this general conclusion. That the fibres of the heart, like those of other muscles, can only be excited while possessed of irritability, and by the application of certain stimuli, of which two appear to be demonstrable: *viz.* that of distention, and that dependant upon some unknown property of the blood itself. Variations either in the degree of irritability, or in the intensity of the stimulus applied to it, will cause proportionate disturbance in its action, and the absence of one or both will arrest it altogether: in this way alone can we account for the disordered actions of this organ, either the direct effect of disease, or of sympathy with that of other parts.

Diseases of the Heart.

In horses that die of pneumonia, the pericardium not

infrequently participates in the diseased action. The most common morbid aspect it has after death, is a partial or general effusion of adhesive matter upon its exterior, which may attach it to the pleuræ, or to the diaphragm, or to both. When first produced, this adventitious covering is nothing more than common albuminous matter infiltrated with serum, to which it owes its bright yellow color; but, if the case happen to run into the chronic stage and continue long therein, it becomes organised, and assumes a variety of appearances which I cannot devote space here to particularize. There is generally more liquor pericardii than in health in these cases, and the membrane itself becomes, in some, preternaturally white, opaque, and dense in its texture.

When inflammation attacks the secreting surface of this membrane, it terminates, I believe, almost always in *hydrops pericardii*. I recollect a case, at the Veterinary College when I was a pupil there, in which death happened suddenly and unexpectedly; though it was very satisfactorily accounted for on dissection by the prodigious distention of the sac with fluid, which had put a stop to the action of the heart. These horses manifest no signs that lead us to the seat of their malady—their disease is generally mistaken for pneumonia; it is not a matter of much consequence however, for in a medical point of view I know of no difference in the general treatment.

The heart itself may be diseased either primarily or secondarily—idiopathically or sympathetically.

The heart is said to be secondarily, symptomatically, or sympathetically affected, when its pulsations vary either in number or strength from those of an ordinary

state of health, in consequence of disease set up in some other part of the body, however remote from the organ itself. If *e.g.* a horse in perfect health *picks up* a nail, which pierces the sensible sole, and causes violent inflammation of the foot, what is called sympathetic or symptomatic fever will ensue, *i.e.* he will heave more than common at the flanks, and his pulse, which before the accident was forty-five, will rise to seventy, eighty, or even ninety: here then the heart is diseased, not in structure but in function, and the extreme pain which the animal experiences in his punctured foot is the cause of it. In such a case the heart is sympathetically affected, I may say *nervously* so; for we cannot explain it but by saying that this pain has excited the nervous system and through it the irritability of this organ in particular. Its irritability being augmented, it contracts upon a less quantity of blood; indeed, for aught we know, the blood itself may possess higher stimulant properties, in either case the same consequences ensue—the heart may pulsate with increased frequency and force, or be only irregular in one of these particulars. And should this organ continue to act for a length of time with extreme frequency, though with diminished force, (for the two extremes are incompatible,) should it beat forty times in a minute or twenty-four hundred times in an hour more than it ought to do, we are not to feel surprised that an animal should sink now and then from exhaustion, induced by such excessive and long-continued over-action of his vital functions. But it occasionally happens that the heart labours under a degree of torpor, and consequent slowness in its action; and this I believe in some individuals is natural. I have myself remarked it in horses in apparent

health, and Mr. SILWELL had a horse under his care in the College whose pulse never exceeded 20*, though his constitutional health at the time was unaffected; most commonly however this is a pulse indicative of inflammation of the brain, we ought therefore to be on our guard against it in staggers.

The heart is now and then primarily diseased. I have met with some few cases of inflammation of it, (carditis) all of which, however, during life, were confounded with pneumonia. Indeed, it but rarely happens that the inflammation is confined to this organ or its membranes: mostly the pleura partakes of it, if not the lungs themselves. When inflammation does principally invade the heart, the surface (not the substance) is mostly the part affected—its close pericardiac tunic exhibits adventitious depositions of a variety of aspects, though they all originate in the effusion of common adhesive matter. I have seen this membrane converted into a substance of the nature of cartilage, on some occasions one-eighth of an inch in thickness. When we meet with a strong, quick, and occasionally irregular pulsation, unattended with so much embarrassment in the respiration as denotes inflammation of the substance of the lungs, and something like palpitations of the heart, accompanied with the common febrile disturbance of the system, we may suspect this organ to be the chief seat of disease. I know of no difference of treatment that carditis requires from pneumonia; it is therefore of little importance, as far as regards their distinction, to know the diagnostic signs of either.

In the human subject the heart is liable to varieties in its natural conformation, and to some that produce often the most unpleasant symptoms to the patient and

perplexing to the practitioner during life: of course they do not admit of relief. I have not seen, nor heard of any cases of the kind among horses. Angina pectoris, syncope, palpitations, and some other cardiac affections, do not come within the sphere of veterinary practice*.

* Mr Henderson, V S London, is in possession of a remarkably fine specimen of ossification of the heart. The walls of the right auricle are converted into bone, and consequently that cavity must have been a passive receptacle for blood which must have flown through it without impulse, or with very little, into the corresponding ventricle. The subject of this disease dropped down dead, in an emaciated condition, in a dust cart.

LECTURE XLI.

On the Mouth.

IN commencing this lecture I may observe, that in quadrupeds the facial angle is one, generally speaking, of very considerable obliquity, in consequence of the prolongation of the face; a feature none possess more strikingly than the horse and the dog. In these animals, consequently, the nose and the mouth are cavities of large dimensions; and the latter appears to have been so constructed, not only to enable the horse to collect his food with more facility, but to enable him to subject greater portions of it at one time to the action of the grinding teeth, whereby the processes of mastication and deglutition are greatly accelerated.

The mouth is composed in part of bone, and in part of soft material: the ossa maxillaria superiora et inferiora, the ossa palati, the maxilla posterior, and the teeth, constitute its bony parietes, the lips, cheeks, palate, gums, tongue, membrane of the mouth, and salivary glands, its soft parts. It will not be necessary to describe again the situation and connexions of these bones; though I may remark here, that unless these particularities be known, I shall not be well followed in the description I am about to give of the other parts.

Lips.

The lips, two in number, *anterior* and *posterior*, arise from the alveolar processes of the jaws, to which they are attached by the muscles that move them, by the cellular substance composing them, and by the membrane that lines them: their united borders form the *angles of the mouth*, or *commissures of the lips*. Externally they are marked by a medium line of division, have little eminences upon their surface, and present a different coating of hair from what is found in other parts, from which here and there project long *whiskers* or horse-hairs; which hairs in the posterior lip constitute the *beard*. The posterior lip is smaller and thinner in substance than the anterior, and the place from which the beard grows is distinguished by a very remarkable prominence of it.

The lips may be said to be both muscular and glandular in their composition. Several small muscles, (which have already come under our observation *,) arising from the maxillary bones, are inserted into them, and endow them with great self-mobility; one alone, consisting of circular fibres, is interwoven in their substance without having any other connexion; this is denominated the orbicularis oris, or sphincter labiorum from its use, which is that of closing the mouth. This muscle is an antagonist to all the others: they raise or depress the lips, or draw them to one side; but this contracts them, and occasionally projects them in such a manner that the horse can exert with them a prehensile power, which is most remarkable at the time that he is picking up grain

* Vide Lecture xxvii. *Facia. Region.*

from a plain surface; indeed the act of nibbling our hands with his lips demonstrates this faculty, and also the force with which he can employ it. The lips are lined by the *membrane of the mouth*, beneath which there are numerous mucous follicles that elevate it every where into little *papillæ*, which are perforated by the mouths of these glands, and may be readily seen with the naked eye by everting either the anterior or the posterior lip. The skin covering the lips is extremely thin, and possesses considerable vascularity and sensibility: to the fineness of this tegument, and to the shortness and scantiness of their pilous clothing, I would ascribe their superior sensitive faculty.

Cheeks.

The *cheeks* are chiefly constituted of the masseter and buccinator muscles; they are, in fact, fleshy parts, covered by the common integument and lined by the membrane of the mouth, studded inwardly with some scattered mucous glands, whose excretory openings become apparent within the mouth when the membrane lining them can be brought into view.

Gums.

The *gums* consist of a dense, compact substance, of the nature of periosteum, which adheres so firmly to the teeth, and to the alveolar processes of the jaws, that it renders the two inseparable but by great mechanical force. Like the other parts of this cavity, the gums are invested by the membrane of the mouth.

Palate.

The palate is divisible into two parts:—the *hard* and

the *soft* palate. The hard palate is constituted of the palatine processes of the ossa maxillaria superiora et inferiora, and of a firm, dense, periosteum-like substance, the vaulted, inward part of which is elevated into several semicircular ridges, vulgarly called the *bars*. The fibres of this substance, which possess great strength, penetrate the pores of these bones in every part, but are most numerous and distinct along the palatine suture; and their interstices are filled up by a dense cellular membrane, through which are dispersed the ramifications of the palatine vessels and nerves.

The soft palate, sometimes called the *velum palati*, is attached to the superior, crescentic border of the hard palate, which border is formed by the palatine bones; from this the velum extends backward and downward as far as the larynx, and there terminates above the epiglottis, in close apposition with that part, in a loose semicircular border. In consequence of the velum palati being long enough to meet the epiglottis, the cavity of the mouth has no communication with that of the nose—these parts form a perfect septum between them; hence it is that a horse cannot respire and vomit by the mouth like a human being, in whom the velum is so short that there is an open space left between it and the epiglottis, through which air or aliment can pass either upward or downward. The soft palate is composed of extensions of membrane from the nose and mouth, between which is interposed a pale, thin layer of muscular fibres, formed by the union of two small muscles proper to this part. The first muscle is the

Levator palati, which proceeds from the pars petrosa of the os temporis, adhering in its course to the eustachian tube, and is dispersed and lost upon the velum.

It will raise the velum in the act of deglutition, and prevent the escape of food or water into the nose.

Tensor palati makes up the chief part of the muscular substance of the palate. It adheres to that crescentic rim of bone which is formed by the ossa palati. In action, it will stretch and tighten the velum, and render it capable of resistance.

The velum then performs the office of a valve; it prevents the food in the act of swallowing from passing into the nose, and it conducts the air from the windpipe into that cavity, without permitting any to escape into the mouth.

Tongue.

THE *tongue*, the principal organ of taste and of deglutition, is a muscular body lying within the cavity of the mouth.

Like the other organs of sense it is double; being composed of two parts, whose union is marked by a longitudinal furrow along its middle, that have no vascular nor nervous connexion, nor in fact any intercommunication whatsoever: so that an animal has to all intents and purposes *two* tongues, and apparently for the same reason that he has two eyes, two ears, and two nostrils. Anatomy, as far as we can carry our researches, demonstrates this; perhaps we have no better proof of it however than what happens in hemiplegia, a disease in which only one half of the body is paralytic; under these circumstances, in the human subject, the patient can only see with one eye, use one arm, and taste with but one, and that the correspondent side of the tongue.

The tongue, in description, is commonly divided into *root*, *body*, and *apex*: by the attachments of the two

former it is held in its situation; the latter is loose and unconnected. At its root, it is deeply and firmly attached by several muscles which arise chiefly from the os hyoides and the maxilla posterior; it is also connected with the pharynx, and with the soft palate. From the sides of the lower jaw, separate layers of the membrane of the mouth are reflected upon its body, where they form by their junction a sort of bridle, which is thence extended to the symphysis: to this part, which serves to restrain the organ in its motions, the name of *frænum linguæ* has been given.

The *dorsum* or anterior part of this organ, has a peculiar covering: though this appears to be continued from the same membrane, it is a different structure altogether, and serves quite a different purpose. The surface of it is roughened by a villous texture, and this is everywhere studded with numerous little conical eminences, called *papillæ*, which are supposed to be formed chiefly of the extremities of nerves, and to be the especial seat of the sense of taste. These papillæ vary in size and figure, and are more abundant and larger upon the base and along the sides of the organ. Interspersed with them are a number of mucous follicles, whose apertures may be seen with the naked eye, through which a mucus is discharged upon the papillary surface that keeps it continually moist, and renders its perception of taste more acute.

The tongue is said to derive a covering from the common integuments; and certainly its strong compact tunic has all the appearances of skin, and presents the common tests of it: the external layer is laminated, is bloodless, is insensible; the internal or substantial part is tough, fibrous, vascular, and sensitive, in fact, is like cutis; and the intermediate or connecting material is weak, soft, and

reticular, and forms a bed for the lodgement of the papillæ. The substance of the tongue itself consists of an interunion, or an incorporation of its muscles, the fibres of which intersect one another and take a variety of directions; but intermixed with them is a fine adipose tissue to which is owing the flabby softness of this organ, and the peculiar aspect it exhibits when cut into.

Though the tongue is emphatically denominated, from its essential character, *the organ of taste*, it is not the only part that possesses this faculty; for the palate, pharynx, and œsophagus, it is believed, participate in it. The tongue also disposes of the food during manducation, and, when it is sufficiently masticated, collects and thrusts it, portion after portion, into the pharynx: moreover, when the animal drinks it is not only employed as an instrument of suction, but as a canal along which the fluid ascends into the pharynx.

Every part of this organ is plentifully supplied with blood. Its arteries are the lingual, branches of large size from the external carotids. The blood-vessels of either side are generally found free from anastomosis with one another: if either of the arterial trunks is filled with injection, it rarely happens that the opposite half of the organ receives any coloring from it. Its nerves are the ninth pair, which run to the muscles, and a considerable branch from the fifth pair; and it is in the extreme terminations of the ramifications of the latter, which are distributed to the papillæ, that the perception of taste is supposed to be inherent.

Salivary Glands.

The salivary glands, properly so called, are six in number, three upon each side of the head:—the parotid, the submaxillary, and the sublingual.

The *parotid*, the largest of these glands, so called from being placed near the ear, lies within a hollow space at the upper and back part of the head, bounded by the branch of the lower jaw before, and the petrous portion of the temporal bone behind; it extends as high up as the root of the ear, and as low down as the angle of the jaw by which a small portion of it is concealed. This gland, like the others of the same class, is enveloped in a dense cellular membrane, and is constituted of many little lobes or *lobuli*, connected together by processes transmitted into the interior from its cellular covering. Every lobulus is composed of a distinct set of secretory vessels, from which numerous *tubuli* arise, conjoin, and at length form one main branch; these branches, which correspond in number to the lobuli, unite and re-unite until they end in one common excretory duct. The duct emerges from the inferior part of the gland, runs along the inward part of the angle of the jaw, and crosses over the posterior edge of the bone immediately above or behind the submaxillary artery and vein; in the remainder of its course it corresponds to the border of the masseter, and about opposite to the second anterior molar tooth, pierces obliquely the buccinator, and terminates by a tubercular eminence upon the inward surface of the membrane of the mouth.

The *submaxillary gland*, of smaller size than the parotid, lies between the angles of the jaw, to which, and to the muscles thereabouts, it is loosely attached by cellular membrane: a portion of it is also generally found proceeding backward as far as the trachea. Its structure is similar to that of the parotid gland. The submaxillary duct begins near the centre of the gland, runs along the under and inner border of the tongue, close to the lower edge of the sublingual gland,

and terminates, by a little mammi-form prolongation of membrane, vulgarly called the *barb* (barbillon) or pap, upon the frænum linguæ, about half-an-inch above its attachment to the symphysis. Among the other ridiculous and mischievous practices of farriers is that of snipping off these processes. They were seemingly designed as valves, to prevent the insinuation of alimentary matters into the ducts. The coats of this vessel are extremely thin and translucent.

The *sublingual gland* is still smaller than the submaxillary, though altogether one much resembles the other in figure. It lies along the under part of the tongue, covered by the membrane of that organ, where, from the lobular unevenness it gives to the surface, its situation is well marked. Its ducts penetrate the membrane of the mouth by the side of the frænum linguæ.

The *use of the salivary glands* is to secrete a saline, limpid fluid, called *saliva*; and this is conveyed and poured by their ducts into the mouth during manducation; here it is mixed with the food which it mollifies and renders more easy of digestion, and at the same time facilitates the passage of the alimentary bolus into the stomach.

On the Pharynx.

The pharynx is a muscular bag of a funnel-like shape, formed at the root of the tongue, and lined by the membrane of the mouth.

It is attached to the sides of the os hyoides, to the bones forming the palate, and to the larynx; as it proceeds backward it grows narrow, contracts, and ends in the esophagus.

The pharynx is composed of three pairs of muscles, called the *constrictores pharyngis*, the description of which

I have purposely reserved for this place, in order that the structure and attachments of the bag might be better understood.

Constrictor pharyngis superior, with its fellow of the other side, constitutes the first pair. It arises from the base of the os hyoides, near to the thyroid cartilage. Hence it runs backward, broadens in its course, and is inserted, through the intervention of a tendinous line which here unites it with its fellow, along the posterior and middle parts of the pharynx.

Constrictor pharyngis medius runs below the former, than which it is larger. It takes its origin from the thyroid cartilage, behind the attachment of the thyro-hyoideus, pursues a like course to the former, meets its fellow upon the posterior part of the pharynx, and is fixed to the tendinous intersection there.

Constrictor pharyngis inferior is to be found still lower. It arises from the posterior part of the cricoid cartilage, whence it passes obliquely upward, forms an inseparable union with the constrictor medius, and is inserted, with its fellow, into the lowermost part of the pharynx, where it joins the esophagus. Their use, as their name implies, is to constrict or contract this cavity during deglutition.

These muscles, the proximate fibres of which are continued into one another and blended together, form the muscular or most substantial part of the pharynx. They are lined by a mucous membrane, which is thick, soft, in places rugose, slightly reddened, and continuous with the linings of the mouth, esophagus, and larynx: it is perforated by the ducts of many follicles which keep its surface moist and slippery by their discharge of mucus.

In the horse, this musculo-membranous sac is partitioned from the cavity of the mouth by the soft palate

and epiglottis. The mouth is bounded above by the *fauces*, and except in the acts of swallowing and coughing has no communication with the pharynx: in the former case, the velum is pressed upward by the food against the posterior openings of the nose; in the latter, the larynx is depressed by a convulsive action of the muscles in the vicinity. Into the cavity above the velum then there are four openings:—two of the chambers of the nose, one of the larynx, and one of the esophagus: the eustachian tubes do not open into the pharynx, they end in two large membranous sacs at the upper part of the fauces. The opening leading into the esophagus is constantly closed, except when alimentary matters are passing to or from the stomach; so that air received into the pharynx through the nose can pass nowhere else but into the windpipe; but if food be returned from the stomach, it will be regurgitated into the nose; at least, only that portion of it which enters the pharynx at the moment that the larynx is depressed in the act of vomiting, can be thrown into the mouth: in the same way that air is in the act of coughing.

On the Esophagus.

The esophagus or gullet is a muscular tube, formed for the purpose of transmitting food from the pharynx into the stomach.

It has its origin from the pharynx, and is there placed at the upper and back part of the larynx, taking the first part of its course above and behind the windpipe, between that tube and the cervical vertebræ. Having proceeded a short way down, it inclines to the left, and soon after makes its appearance altogether on the left side of the windpipe, and continues so placed during the remainder

of its passage down the neck: this explains why we look for the bolus during the act of swallowing on the *left*, and not on the right side of the animal. In company with the trachea the esophagus enters the chest between the first two ribs, and there, running above that tube, quits it for the superior mediastinum, which cavity it traverses below and a little to the right of the aorta posterior. Immediately below the decussation of the crura the esophagus pierces the substance of the diaphragm, and enters the stomach, at a right angle, about the centre of its upper and anterior part.

The esophagus presents externally a strong, red, *muscular* coat; internally, one remarkable for its whiteness, which in its nature is *cuticular*. The muscular coat is composed of two orders of fibres:—a longitudinal forming an outward layer, and a circular an inward layer: the former will shorten the tube, and perhaps dilate it for the reception of food; the latter, by successive contractions of the canal, will transmit the food into the stomach. The second, or internal coat, is called the cuticular from its analogy to the cuticle of the skin; though it is continuous with the membrane of the pharynx, it is of a totally different composition; it is thinner, but it is much more compact and stronger in its texture, and, I believe, is both insensible and inorganic. It adheres to the muscular covering by a fine cellular tissue, the extensibility of which gives full play to the latter; and during the empty or collapsed state of the tube is thrown into many longitudinal *plicæ* or folds; or, if a transverse section is made of the tube, projects in folds from its divided ends: both which appearances result from the contraction of the one coat, and the want of adequate elasticity in the other. Be-

tween this and the external coat, embedded in the interposed cellular tissue, are numerous mucous follicles, which pour forth their secretion upon the internal surface to lubricate it, and thus afford a gliding passage to the manducated mass into the stomach.

Diseases of the Mouth.

The membrane of the mouth may be excoriated, lacerated, or otherwise injured in a variety of ways. The repeated contusions made by the pressure of the port of a sharp curb-bit will, now and then, be followed by deep exulceration of the posterior jaw, sometimes of the palate, and even carries of the bones themselves.

Another, and not a very uncommon accident, is laceration of the frænum linguæ; which is occasioned by forcibly drawing the tongue out and pressing it against the edges of the molar teeth in the act of giving a ball. But the *substance* of the tongue may be injured—bitten by the horse himself, which I suspect generally happens during sleep; at least, I saw a case of this description some time ago, in which the tip of the organ, to the extent of about four inches, was nearly severed from the body, that took place during the night; and this was the only explanation that appeared feasible at the time. Here it was found necessary to employ sutures.

Ulceration of the cheeks also may take place; and when it does I believe it to be the result of some abrasion of surface, either in consequence of the edges of the molar teeth becoming sharp from irregular wear, as they do now and then in old horses, or from the irritation of a sharp twisted snaffle, or perhaps from some

prickly or other mechanically noxious substance taken in and masticated with the food.

Horses having one or other of these affections froth at the mouth from an increased secretion of saliva, *eat their food*, and often refuse to eat any but what is of a soft and easily-masticated nature. These symptoms lead us to examine the mouth, where we seldom fail to discover the source of the evil.

We need not trouble ourselves much about remedies for these accidents; if the cause be removed there is little doubt but the sores will heal. Should the jaw or roof of the mouth have been exulcerated by a curb-bit, a snaffle or Pelham bit ought to be worn until the injury shall have been repaired. If there is any appearance of necrosis, the nitric acid lotion—about ten drops to the ounce of water, will, used with discretion, prove of great service: as soon as the dead bone has come away, tincture of myrrh, or the alum wash * may accelerate the granulating process. But we must not be too inter-meddling here: there is often much harm done in these cases by the over-doing, officious practitioner. When the frænum linguæ or the tongue itself is lacerated, the main object in the treatment—and a troublesome one it is, is to keep the wound clear from the manducated matters, which are (especially hay) continually lodging there; and with this view I would lay any pouch or sinus open that was found in it with a bistoury. In regard to dressings, none are in general required, but, if we are compelled or determined to do something, we may wash the parts

* ℞ Alum. Pulv. ʒj.
Aq. Puræ ℔j.
M. ft. Lotio. Injicienda ter quaterve die.

frequently in the course of the day with a strong solution of alum, or some other astringent application. If the teeth offend, from having worn sharp or irregular, they may be filed smooth; and as for the excoriations they have occasioned, they will get well of themselves.

Lampass.

THE lampass is a name given by writers on farriery to a swelling or an unnatural prominence of some of the lowermost ridges or bars of the palate. I should not have thought it worth while to have taken up time with this supposed malady, but that it has called forth the infliction of great torture on the animal by way of remedy, and that it has been a cloak for the practice of much imposition on those who have been in the habit of consulting farriers on the diseases of their horses. I allude to the cruelty and barbarity of burning the palates of horses so affected; equally consistent would it be, and, were it consistent, more requisite, to cauterize the palates of children who are teething; for, the truth is that the palate has no more to do with the existing disease (if disease it can be called) than the tail has. Lampass is neither more nor less than a turgidity of the vessels of the palate consequent upon that inflammatory condition of the gums which now and then attends the teething process; but, notwithstanding this plain and simple truth, the animal (and I believe this is owing to its not having been explained before) continues to be persecuted for it—even by some *professional* men as well as farriers, up to this very hour. The practice is a stigma upon our national character, and a disgrace to the professors of veterinary science.

Teething in children indeed is now and then a season

of restlessness and pain, and was one, before surgeons were in the habit of using the gum-lancet, of anxiety and danger, but it is not so with horses, they never have any feverish irritation created in the system, though they have some tenderness of the gums and palate, and though some few, in consequence of this tenderness, *cud* their food or refuse to eat any but what is soft and unirritating. In such a case, if any thing requires to be done, we ought to lance the gums —not the palate, but I do not remember ever to have had occasion to do this but once *. The futility of lotions or in fact any external or internal medicament,

* About three years ago I was requested to give my opinion of a horse, then in his fifth year, who had fed so sparingly for the last fortnight, and so rapidly declined in condition in consequence of it, that his owner, a veterinary surgeon, was under no light apprehensions about his life. He had himself repeatedly examined his mouth without having discovered any defect or disease, but another veterinary surgeon to whom he had shown the animal was of opinion that the averseness or inability manifested in masticating food, and the consequent *cudding* of most of that taken in, arose from a preternatural bluntness of the faces of the molares, these teeth therefore were filed, but no benefit resulted. It was after this that I saw the horse, and I confess that I was just as much at a loss in my first examination to offer any thing satisfactory on the case as many others who were then present, for his teeth and mouth altogether appeared to us all to be perfect and healthy. As I was ruminating however after my inspection on the apparently extraordinary nature of the case, it struck me that I had not seen the tusks. I immediately betook myself to a re-examination, and then discovered two little tumors, red and hard, in the situation of the posterior tusks, which, when pressed, appeared to give the animal insufferable pain. I instantly took a pocket knife and made crucial incisions through these prominences down to the teeth, from which time the horse recovered his appetite and was restored.

will sufficiently appear without any comment here, I need not therefore extend this unimportant subject.

Stricture of the Esophagus.

In the Veterinary Museum belonging to the Riding House Establishment at Woolwich, is an elegant preparation of this disease. I have not been able to collect any more particulars of the case than those contained in the following short memorandum, which I have transcribed from the book of reference to the preparations.

No. 26.—"Shews a portion of stomach taken from a horse that had (during life) some apparent difficulty to swallow his food. The animal became so much reduced in condition that it was thought advisable to destroy him. On dissection, the œsophagus, at its entrance into the stomach, was found almost impervious from stricture."

LECTURE XLII.

On the Viscera of the Abdomen.

THE abdomen or belly is mostly formed of soft parts, and they consist principally of the four pairs of abdominal muscles, the situation and attachments of which I have already described. Its anterior part, where the most important viscera lie—such as the stomach and liver, is bounded by the false ribs laterally, and in front by the diaphragm; its posterior, containing the organs of generation, by the pelvis, and its superior, by the dorsal and lumbar vertebræ, and by the muscles of the loins.

Before I take a view of the interior of the abdomen, it will be necessary to point out those compartments or *regions* into which anatomists have divided it, by drawing certain imaginary lines over its superficies, from which extend so many imaginary planes through the cavity; for had not some such division of it been made, our description of the particular situation of the different viscera within, or of any wound inflicted in its parietes, must have been confused and often unintelligible. The first or grand division of the abdomen is into three regions. The anterior or *epigastric region* is the space comprehended between the ensiform cartilage and a

line drawn across the belly, posteriorly to the cartilages of the false ribs; it is subdivided into three others:—the *scrobiculus cordis*, the space included between the ribs; and the *right and left hypochondria*, the lateral cavities or boundaries of it. The middle or *umbilical region* extends in breadth from the line just mentioned to another drawn from one anterior spinous process of the ileum to the other: it is equally subdivided into three others by transverse lines, the middle of which retains the name of *umbilical region*, while the lateral are called the *lumbar regions*. The posterior or *hypogastric region* extends over the remainder of the belly. It is also subdivided into three:—the part included between the spinous processes of the ilea and the pubes, receives the name of *regio pubis*; the lateral subdivisions, of *iliac regions*.

The abdominal viscera of the horse differ from those of the human subject chiefly in the shape and comparative size of the stomach and colon: their general relative situation we shall find to be much the same in both.

Having opened the abdomen, by making a crucial incision through its muscular parietes, we perceive that the interior of the cavity and the viscera lying in it, present an uniform glistening surface, are smooth, humid, and slippery to the feel, and are bedewed with a limpid liquor; all which arises from a general investing membrane that is of the same (serous) class as the pleura, and appears, in most respects, to perform similar uses: to this part the name of *peritoneum* has been given.

Peritoneum.

The peritoneum is a membrane then that lines the ca-

vity of the abdomen, and is reflected upon the contained viscera. If I introduce my hand into the belly, every surface I apply it to being covered by peritoneum, I am not, in truth, able to touch any of the viscera within it: this, we know, is precisely what happens in regard to the pleura.

The texture of this membrane also is like that of the pleura. If I strip it off from any part, I find it rough and shaggy exteriorly, from the presence of numerous little flocculent adhesions; and this shews the nature of its attachment to the several parts it invests; *viz.* by cellular tissue. But its interior surface is every where smooth, humid, and slippery, and this is assignable to two causes—to the uniformity and compactness of its texture, and to the exhalation of a serous vapor, which after death becomes condensed, and which we always find more or less of, in the liquid state, between the different viscera. The peritoneum appears to be composed of condensed cellular membrane, interwoven with numerous blood-vessels, some nerves, and many absorbents. It is extremely elastic, whereby it accommodates itself, without corrugation, to the perpetually varying capacity of this cavity and the frequent change of volume and relative situation of many of the viscera: indeed, at certain times, it must admit of very considerable extension; *e. g.* in the mare during gestation, and in ascites.

What are called the *ligaments of the peritoneum*, are certain parts which in the fœtus were vessels of importance, but which in the adult degenerate into impervious cords, and for this reason have their name altered. The *anterior ligament* or *ligamentum rotundum*, originally the umbilical vein, runs between the peritoneum and abdominal muscles, from the *umbilicus* or navel to

the liver. The two *posterior ligaments*, consisting of what once were the umbilical arteries and the urachus, pass in the same manner from the navel to the bladder; the former traversing its sides to join the iliac arteries, the latter entering the bladder at the very apex of its fundus. In the young animal it generally happens that these vessels are pervious for a considerable distance, but their calibre is exceedingly reduced in size, and their coats proportionately thickened.

The principal use of the peritoneum is to furnish a serous fluid—a fluid that exists in a vaporous state during life, for the lubrication of every part of the membrane; in consequence of which those viscera that are continually moving within the belly, glide over one another not only without friction, but without the least consciousness of their motions on the part of the animal himself. In addition to this, the peritoneum furnishes most of the viscera with a complete external tunic, and thereby adds strength and firmness to their several textures; it attaches, and thus supports, and confines those viscera within certain limits, in their respective places; and it strengthens the cavity altogether by its uninterrupted extension through and around it.

I shall not speak of the reflections of this membrane until I have pointed out the situation of the different viscera.

Situation of the Viscera of the Abdomen.

When the cavity of the belly is laid open, the large intestines first present themselves to view; consequently they are placed undermost when the animal is standing, and are immediately lying upon the abdominal muscles. About the middle of the exposed cavity, the apex of the

cœcum protrudes from the body of that gut, which is extended to the right side, encircled by the colon. Generally speaking, the small intestines are not seen on first reflecting the muscles; this however will depend on the state of the large, for if they be flaccid some of the small guts will insinuate themselves between the cœcum and colon: should we not see them however in the first instance, they may at once be brought into view by turning the cœcum to the right side.

The STOMACH is principally lodged in the left hypochondriac region, though a part of it extends into the epigastric and there crosses the spine. Its anterior or convex part lies against the diaphragm, and the false ribs of the left side; its posterior or concave part is concealed by the intestines; its lower surface is invested by omentum; its left extremity has the spleen attached to it, which viscus also extends along its great curvature; and its right is in contact with the left and middle lobes of the liver.

Before I proceed to describe the situation and course of the intestines, it is necessary to observe, that anatomists have divided them into the *small* and *large*; and that the first, beginning from the stomach, comprehend three subdivisions—the *duodenum*, *jejunum*, and *ileum*; and that the latter, commencing from the termination of the small, are also subdivided into three—the *cœcum*, *colon*, and *rectum*.

From the right extremity of the stomach arises the DUODENUM, which soon after its origin forms a curvature around the head of the pancreas; having the liver above, and the great arch of the colon below it. Having reached the concave part of the liver, it makes a sudden turn backward and to the right, and becomes

attached to the right kidney; it then crosses the spine, between the roots of the mesentery and mesocolon, to the left side, where it takes the name of jejunum. This gut, during its course, is so closely bound down by peritoneum, that its motions must be exceedingly limited; so that it will always bear pretty nearly the same relative situation in regard to those viscera whose motions are confined—the stomach, the liver, and the kidney.

The JEJUNUM and ILEUM, which do not essentially differ from each other, except that the latter is one-fifth longer than the former, constitute together numerous convolutions, which are lodged principally in the umbilical region, where they are encircled and in part concealed by the colon. They are but loosely connected to the spine by peritoneum; so that, unlike the duodenum whose attachments are very short, they can move in various directions and to a considerable extent: a circumstance, of course, that will materially affect their relative situation.

The ileum, towards the right side of the cavity, terminates in a part of the large intestines, which, from its continuity with the colon, to which and to the cœcum it appears to give origin, has been denominated the *cæcum caput coli*, or blind head of the colon. From this part proceeds downward the body of the CŒCUM, and thence its apex protrudes, in the manner I have already described, amid the convolutions of the colon.

The COLON, taking its origin from the same part where the cœcum begins, at first passes downward, and encircles the body of the cœcum, running both before and behind that gut; then it reflects upon itself, and makes a second turn like the first; so that this part, which may be called its *great arch*, is double. That

portion of the second flexure of the gut which forms the upper and anterior part of the arch, and which fills up the bottom of that space between the cartilages of the false ribs, is of very considerable bulk; in its course, however, to the left side of the spine, it becomes again contracted, and is there attached to the spleen, with which it runs in contact. Under the left kidney it makes a sudden curve backward, and becomes reflected upon itself somewhat like the letter S; from which peculiarity of figure, this part is called the *sigmoid flexure of the colon*. It is worthy of remark here, that, although the colon and cœcum are intestines that possess considerable motion, they are so united that they cannot alter their places materially in regard to each other: I may add also, that they will invariably occupy the lowermost parts of the abdominal cavity.

As soon as the colon has reached the basis of the sacrum, it takes the name of RECTUM; the remaining portion of gut, however, so called, is not perfectly straight, but follows the bend of that bone. It terminates by an enlarged extremity in the anus.

The OMENTUM (the intestines being drawn to one side) is now brought into view, investing the lower part of the stomach; to the great curvature of which, and to that portion of colon which crosses the spine to form the segmoid flexure, (its last turn,) it is attached. In the horse, the omentum is small, and seldom contains much adipose matter. It consists of four layers of peritoneum: two derived from the stomach, and two from the colon; which are disposed in a manner I shall point out when I come to speak of the reflection of that membrane.

The small intestines are loosely connected to the spine

by a duplicature of peritoneum, called the MESENTERY; the colon is attached in like manner to it by a production of the same membrane, named the MESOCOLON; and the rectum is confined in its place by a similar reflection, by some described as the MESORECTUM.

The LIVER is mostly placed in the left hypochondriac region, though some part of it lies in the epigastric, and a small portion extends between the stomach and diaphragm into the left hypochondrium. This viscus is confined in its situation by means of, what are named, its *ligaments:* which, with the exception of one, are nothing more than productions of peritoneum. The one attaching the right lobe to the diaphragm, is called the *right ligament:* a similar one connecting the left to it, the *left ligament;* between the diaphragm and its middle lobe, we find the *suspensary ligament;* and immediately above that, surrounding the vena cava posterior, the *coronary ligament;* lastly, within the folds of the suspensary ligament are the remains of the umbilical vein, to which the name of *round ligament* has been given. The large lobe of this gland is concealed by the great arch of the colon: its left and middle lobes are in contact with the stomach, and its right with the duodenum and upper margin of the right kidney; to all of which it has peritoneal attachments.

The SPLEEN is situated in the left hypochondriac region, lying there within the concavities of the false ribs, with the hindermost cartilages of which its margin precisely corresponds; so that if the abdomen were pierced from the left side posteriorly to the last rib, this organ would escape injury. It is attached to the left half of the great curvature of the stomach; but the chief bulk of it lies behind and rather above the stomach. Its an-

terior extremity lies in contact with the left lobe of the liver; its posterior is connected to the left kidney, and concealed by the convolutions of the colon.

The most ready way to get a view of the PANCREAS is to tear through the omentum. It lies across the spine, in the epigastric region, under the crura of the diaphragm, immediately behind and a little above the small curvature of the stomach. Its head is surrounded by the duodenum, with which, and with the stomach and colon, it is chiefly connected; and its body is pierced by the vena portarum, and has one attachment to the spleen, and another to the left kidney.

Reflection of the Peritoneum.

IN order that the various connexions and uses of the peritoneum may be perfectly understood, it is usual, at this time, to trace (what the Schools call) its *reflections*: by which is meant, to show the way in which it lines the cavity, and afterwards invests the different viscera contained in it. The peritoneum, though, taken as a whole, a perfect sac, is not, as far as regards the cavity of the belly, a circumscribed bag; at least, it is not in the male after the descent of the testicles, for those organs in their passage necessarily carry down a portion of it into the scrotum, which consequently becomes a continuous cavity, and is one that has ever afterwards free communication with that of the abdomen, so that water or air will readily pass from the one to the other: notwithstanding this however, I repeat, the integrity of the peritoneum itself is unimpaired. In my description of the extensions and folds of this membrane, it imports but little where I commence; it is most usual to make a beginning at the pelvis.

The peritoneum having lined the inferior parietes of the abdomen—the recti and other muscles, passes over the anterior part of the pubes upon the fundus of the bladder, whence it is extended to the sides of the pelvis, forming the *vesical ligaments*. Having given a covering to every part of the bladder but its neck and the under surface of its body, it next includes the rectum, attaches the gut to the spine by an union of its investing laminæ, and thus produces the mesorectum. From the basis of the sacrum it passes upon the lumbar vertebræ, whence it soon departs to attach and invest the colon from which it repasses upon the spine, and thus forms the mesocolon. It now descends again into the cavity, making one layer of the mesentery, to give a covering to the small intestines, and from them extends to the great arch of the colon; it then joins the other layer of the mesentery, derived from the pancreas, which has completed the investment of these intestines, and proceeds backward in intimate union with it; soon however both are reflected again and pass onward to the stomach, and thus form that loose production—the omentum, which consequently consists of four layers of peritoneum. From the stomach one portion of it passes to the spleen, and having enveloped and continued it, splits, and spreads its layers over the abdominal parietes; another portion leaves the stomach for the liver, and when it has given a like close tunic to this organ, is continued anteriorly upon the diaphragm, which extensions, consisting of two layers, are called *the ligaments of the liver*. But a portion of the membrane passes backward from the liver to the duodenum, whence it stretches across the pancreas to form the anterior layer of the mesentery. The kidneys and the pancreas do not receive peritoneal tunics, as the liver and

spleen do: the membrane simply passes over their unattached surfaces.

Diseases of the Peritoneum.

THIS membrane is liable to inflammation of two kinds: — acute and chronic; of which the former appears to be of the more frequent occurrence.

ACUTE PERITONITIS in the horse rarely arises spontaneously, but is the effect of wound, strain, or some other injury of the membrane. Of wound, as when it supervenes upon the operation of castration; in which case the inflammation creeps along the cord, and extends from the tunica vaginalis to the peritoneum: a result not likely to happen in the human subject, in consequence of the abdominal ring being closed. Of strain, as after some extraordinary effort; such as hard galloping or leaping *. Add to these causes that the presence of hernia, or the operation, may occasion it. In cases of this description then, when the symptoms indicate abdominal disease, we may suspect this membrane to be the seat of it; for the symptoms so much resemble those of enteritis that I know of none that will serve us as diagnostic. Fortunately for us however, this is of little or no consequence, for the treatment of both is to be conducted by the same means and in the same manner; I shall therefore reserve what I have to say in continuation until I have occasion to speak of enteritis.

With regard to CHRONIC PERITONITIS, I met some

* Three years ago I attended a horse that died in consequence of a severe run with Lord DERBY's hounds, in whom inflammation of the peritoneum was the only morbid appearance discoverable after death: the symptoms resembled those of enteritis

years back with so well marked a case that I cannot convey a more correct account of the symptoms, &c. than is contained therein; I shall therefore transcribe it, in the abstract, from the register of extraordinary cases. A chesnut horse, the property of my father, four years old, was attacked in the latter end of December, 1812, with the ordinary febrile and anasarcous affection (swelled legs) prevalent at this season, which by exercise, purgatives, and diuretics, was dispersed in the beginning of January, 1813. From this time until March, the horse not only throve in condition but got exceedingly fat, showed no further signs of ill health, and was ridden daily by the groom. The first circumstance that attracted notice—the ushering in of that which proved to be the cause of his death, was a complaint from the man that the horse "*bent under him*" occasionally in trotting, as if from weakness or diseased spine, which was accompanied with a faltering step or two, imperfections in action never experienced before. Soon after this, on the sixth, his breathing became affected, and so much so that he was exceedingly distressed if he trotted even but a short distance; in two or three days more, his appetite began to fail him, and about the same time his bowels became much relaxed. My father being now absent from home, the treatment of the case devolved upon me. Suspecting that there was some disorder in the alimentary canal and that this was an effort of Nature to get rid of it, I promoted the diarrhœa by giving mild doses of cathartic medicine in combination with calomel. On the third day from this, prolapsus ani made its appearance, which for a few hours so rapidly increased in volume that I with difficulty, by the use of the poppy fomentation, by manual operation, and by the exhibition of tinct. opii internally, arrested its

protrusion, and at length effected its reduction. After the return of the gut, the animal grew daily duller and more dejected, manifesting evident signs of considerable inward disorder, though he showed none of acute pain, the diarrhœa continued; an œdematous swelling formed under the belly nearly centrically, and considerable tumefaction of the legs speedily followed. In this state, on the 15th, eight pounds of blood were drawn, two ounces of the oil of turpentine given internally, and a fomentation was used to the belly. During the whole of this day he remained exceedingly dejected, and appeared insensible to what was passing around him; in the evening he was seized with symptoms of inflammation of the bowels, which, in spite of another venesection and some subordinate measures, carried him off in the course of a few hours. Prior to dissolution, the skin under the belly became prodigiously distended with fluid, and the limbs enormously swollen; and it was remarked by my father, who had not seen him since the onset of his illness until the day of his death, (but not by us who were in attendance) that the belly itself was of unusually large size.

Dissection. A slight blush pervaded the peritoneum, at least the *parietal* portion of it, for the coats of the stomach and intestines preserved their natural whiteness. About eight gallons of water were measured out of the belly. The abdominal viscera, as well as the thoracic, shewed no marks of disease.

This is the only case of the kind that has come to my knowledge.

LECTURE XLIII.

On the Stomach.

THE stomach is a large musculo-membranous pouch or bag, placed within the cavity of the belly, and destined for the reception of the food. Without any exception, this appears to be the most important organ in the body; and the strongest proof probably we have of its being so, is the universality of its existence, from the highest to the lowest class of animals: this is not the case with the brain, much less with the heart, and it was this circumstance that led Mr. HUNTER to regard the presence of a stomach as the chief characteristic between animals and vegetables. The stomach has been emphatically denominated *the organ of digestion*; for within it, the aliment transmitted by the esophagus in a crude state, undergoes its primary and principal change in a process the object of which is to convert it into matter necessary for the growth, support, and repair of every part of the body.

The stomach is situated principally in the left hypochondrium, which it nearly fills, extending more or less into the epigastrium, according to its state of distention; its anterior part lies in contact with the liver; its left

extremity is opposed to the diaphragm and spleen, it lies in part upon the small, but mainly upon the large intestines. It is evident that the full and empty conditions of the stomach will affect its position in relation to the neighbouring viscera, and that the motions of the diaphragm will alter its situation; for during the recession of that muscle, it must be pushed into the umbilical region. On the other hand, the action of the diaphragm will be interrupted by distention of the abdominal viscera, and more particularly by fulness of the stomach, for increased pressure will counteract its efforts to recede, and the chest, under these circumstances, will be expanded by the other inspiratory agents—the intercostal muscles, and those passing from the ribs to the fore extremities. This accounts for the inaptitude of horses, recently fed, to undergo violent exertion, and the increased embarrassment in respiration that hard work then occasions—why they should be sooner *blown*, and why they will, if pressed, absolutely sink from exhaustion: hence the practice of keeping hunters *short of water*, and of feeding them unusually early, and on corn only, on the morning of hunting.

The stomach has been not inaptly likened to the air-bag of a set of bag-pipes: I should probably fail in conveying so good an idea of its shape by any other resemblance. For the convenience of description, it has been divided into several parts: *e. g.* an *upper* and an *under surface;* a *left* or *large extremity*, which is formed into a large blind pouch or *cul-de-sac*, called its *fundus;* and a *right* or *small end*, which opens with a bend into the duodenum or first intestine; a *large curvature* to which the spleen is attached, and a *small* one extending between its two openings, the former of these, in

the living animal, is turned upwards and backwards, the latter downwards and forwards.

The stomach has two *orifices*. One, in which the esophagus terminates, is situated about the centre of its anterior part, at the right extremity of the small curvature, and takes the name of *cardia*: it is constantly closed but when matters are passing into or out of the organ. The other is placed at the termination of the right or small extremity, and opens into the duodenum; though it has the power of closing, it is mostly open.

The stomach is fastened in its place by its union with the esophagus and duodenum. It has other connexions, but they are of a peritoneal nature:—at its great curvature it is attached to the spleen and colon by the omentum, at the cardia to the diaphragm by a fold of peritoneum, and near its pyloric end to the liver by an extension of the same membrane. The esophagus, previously to entering the stomach, makes a sudden incurvation downward, by which an angle of such a nature is formed between the stomach and it as to have the effect of a valve in preventing the regurgitation of aliment.

Perhaps no animal, in proportion to its size, has so small a stomach as the horse. Let us only compare it with that of the human subject: the stomach of a middle-sized man (a man weighing 12 stone) will contain more than three quarts of water; whereas that of an ordinary-sized horse, whose body exceeds his in weight and bulk by *eight* times, will not hold more than three gallons, or *four* times the quantity of the man's. We are to bear in mind, however, that the stomach, like other hollow muscles, has the power of accommodating itself to the bulk of its contained matters; so that

we are not to draw conclusions of its comparative volume barely from the state of fulness in which we may find it. At another time, I shall endeavour to shew why Nature has given so small a stomach to the horse, an animal whose consumption of food we know to be enormous.

The stomach has four coats. The first is that which it derives from the peritoneum, thence called the *peritoneal coat:* at the greater curvature the layers of the omentum disunite and separate, and, including the gastric vessels and nerves, spread uniformly over every part of the organ. In texture, it is the same as the parietal portion of that membrane, and like that exhales a serous moisture from its outward surface, to prevent friction between the stomach and those viscera with which it lies in contact. Inwardly it adheres, by a fine dense cellular tissue, to the next tunic.

The second or *muscular* coat, which is also white, lies immediately underneath the peritoneal. It is composed of two orders of fibres, which may be distinctly seen when the stomach is distended with air, and its peritoneal covering stripped off. The exterior fibres run in a longitudinal direction, and are fewer in number and weaker than the interior, which take a circular course, and are strong and well-marked, particularly about the pyloric extremity, where they appear to be blended with those of the duodenum. From this arrangement of the fibres, the cavity can be diminished in every dimension. If we slit open the pylorus, we shall find a valvular projection, forming the boundary line internally between the stomach and the intestine, this is called *the valve of the pylorus;* it is made up of a circular production of muscular fibres enveloped within a fold of the mucous coat.

Though this valve certainly tends to prevent the return of alimentary matter from the intestines, yet do physiologists not regard this as its principal use; they believe that its operation is rather that of preventing the escape or expulsion from the stomach of any crude or indigested aliment—of solid matters that have not been duly softened and dissolved, into the intestinal canal. I say *solid* matters, for fluids pass freely through it at all times into the intestines, without any detention whatever in the stomach. Actual experiment evinces that they do; but we may also satisfy ourselves of this fact by contrasting the quantity of water a horse that is thirsty will take at a draught with the known capacity of his stomach.

The stomach of the horse species differs remarkably from that, I believe, of all other quadrupeds, with the exception of the graminivorous *monogastric*, in having a partial *cuticular* lining, which may be considered as a third coat: by turning the viscus inside out, or by slitting it open along its great curvature, this part, so conspicuous for its white and wrinkled surface, will be distinctly exposed to view. And now we can trace its well-defined border, forming the boundary line between it and the fourth coat, the course of which is waving or serpentine, something like the figure of an S. This lining extends over the cul-de-sac or left extremity, covering not quite one-half of the whole internal surface of the stomach. We commonly find it thrown into wrinkles, termed *rugæ*, which sometimes are so disposed as to form a sort of network: this is owing to its not being possessed of sufficient elasticity to accommodate itself to the varying capacity of the organ. This substance is of the same nature as the lining of the esophagus, with which at the cardia

it is continuous. Numerous small openings are visible upon its surface, through which issues a mucous fluid that is of use in the digestive process.

The fourth, *mucous*, or *villous coat*, extends over that part of the stomach not lined by the cuticular. Its surface is of a yellowish cast, inclining in some places to a red. It is soft, fine, and cellular in its texture, and possesses considerable vascularity. When closely and attentively examined, it is found to present inwardly numerous little ragged or shaggy processes, which, from their giving it the appearance of velvet, have received the name of *villi;* these appear to be made up principally of the minute ramifications of blood-vessels, which we believe to perform the office of the gastric secretions: by some the villi are supposed to have numerous minute glands in their composition; but, in point of fact, we do not know precisely what is their intimate structure. This coat, as well as the cuticular, occasionally exhibits numerous rugæ upon its internal surface, which disappear upon extension.

With the exception of the brain, for no organ has Nature made more ample provision to insure a supply of blood than for this. Its arteries are—the *superior gastric*, which is derived from the posterior aorta, and is distributed to its small curvature, and upper and under surfaces; the *right* and *left gastric*, which branch from the hepatic and splenic arteries, and take their course along its great curvature; besides numerous small ramifications from the trunk of the splenic, called the *vasa brevia*. Most of these vessels take a tortuous course, and by so doing accommodate themselves to the varying volume of the organ. Their ultimate distribution is to the villous lining, in which they ramify

to great minuteness, and exist in such abundance as to render it uniformly red when injected with size and vermilion. Its veins, which are somewhat larger in size than the arteries, and have no valves, terminate in the vena portæ. The stomach possesses numerous absorbents, and is well supplied with nerves from the eight pair and sympathetic.

On the Intestines.

The intestines are cylindrical, musculo-membranous tubes of various dimensions, forming one continued but convoluted canal from the pyloric orifice of the stomach to the anus, in which the process of digestion, begun in the stomach, is completed.

These viscera, taken collectively, cannot be said to be lodged in any particular regions; they are spread over the inferior part of the belly, immediately supported by the abdominal muscles, and are found, one or more of them, in every region of a cavity of which they occupy by far the greater part.

The intestines of the horse are ninety feet long, or between *eight and nine* times the length of the body: those of the human subject are about thirty-four feet long, or *six* times the length of the body *.

These viscera are divided into the *small* and *large*

* I was at first undetermined in my mind how I should draw this comparison. I put down the ordinary height of men at 5 feet 8 inches. I then extended a line from the forehead, above the orbital arch, of a middle-sized horse, to the point of the hip, and thence carried it to the ground: this I found to measure 11 feet. These then, with the relative lengths of the intestinal canals, I have taken as my *data*. Whatever objections they may be liable to, we may draw this conclusion from them:—*that the intestines of a horse greatly exceed in proportionate length those of a man.*

intestines; the latter, as their name implies, exceed in magnitude the former, and each of these divisions is subdivided into three parts that have received particular names. But I shall take into consideration the general structure of these tubes before I proceed to a detail of their peculiarities.

An intestine is composed of three coats. the first or external is called the *peritoneal;* the second or middle, the *muscular*, and the third or internal, the *villous* or *mucous coat*.

The *peritoneal coat* is simply a covering continued from the peritoneum itself, which includes the mesenteric vessels and nerves in its way to the intestines, and connects them to the spine, to one another, and to other viscera; it intimately adheres by fine cellular membrane to the muscular coat; and it serves to strengthen the guts, to furnish a lubricating watery perspiration, and either to restrain their motions within certain limits or confine them altogether to their places.

The *muscular coat*, like that of the stomach, is composed of two orders of fibres:—a longitudinal, running immediately underneath the peritoneum and consisting of a few pale scattered fasciculi; and a circular, of which the fibres are placed more inwardly, are stronger, more numerous, and more distinct. By a combination of their actions, the intestine is contracted in every direction; for while the former will have a tendency to shorten it, the latter order of fibres will operate forcibly in diminishing the calibre of its canal.

The *villous* or *mucous coat* of the intestines, though in its general appearance it resembles that of the stomach, differs from it in many essential particulars. It is of infinitely greater extent, presenting a surface for absorption and secretion, exceeding even that of the

common integuments. Its *villi* (more especially in the small intestines) instead of consisting principally of minute blood-vessels, are crowded with lacteals, which, as I remarked in my lecture on the absorbents, are supposed to take their origin from them by open mouths *. Besides the villi, its interior is studded with numerous glandules, the size and distribution of which vary somewhat in the different guts; they secrete a glary, mucous fluid, which they pour forth upon the surface of this membrane, in order to sheath and defend it from the acrimony or mechanical irritation of the aliment, (and from any other mechanical or chemical irritant) and to facilitate its passage through them. In the small intestines of the human subject, this coat is collected into numerous transverse folds, called valvulæ conniventes, from their being supposed to have the effect of so many imperfect valves; but in those of the horse no such structure exists, it not being requisite (for reasons I shall hereafter give) to retard the passage of the aliment here, or to multiply the lacteal apparatus. Having described the appearance and structure of the intestines in general, I shall proceed to point out the peculiarities of each of them, beginning with the

Small Intestines.

The small intestines, though smaller in their calibre than the large, exceed them in length. They are constituted of three parts or subdivisions, called the *duodenum*, *jejunum*, and *ileum*.

The *duodenum* is more capacious than either of the others, especially at its beginning, though in length it

* Part I. Lect. vii. page 110.

is much inferior to them: its name however is inapplicable in the horse, for it is nearly twice twelve inches long. I have already given its situation, course, and connexions, I have no need therefore to enter again into their detail here; all I wish to repeat is, that it begins at the pylorus of the stomach, and having crossed the spine terminates in the jejunum. It not only differs from the others in being larger and shorter, and in being straighter, but in being redder—more vascular than either of them; it is however at once distinguished from *all* the other guts, both large and small, by receiving the ducts of two important glands, situated near it, *viz.* the liver and pancreas: these tubes terminate by one common orifice upon its internal coat, about the distance of six inches from the pylorus. Unlike the jejunum or ileum, the duodenum receives only a *partial* covering from the peritoneum, by reflection over its inferior and lateral parts, the superior surface being attached to the liver, kidney, and spine by cellular membrane only. Its motions are exceedingly limited.

The *jejunum*, paler, less in calibre, and much longer than the duodenum, is extremely tortuous in its course, and floats about loosely within the cavity with the convolutions of the ileum: there is, in fact, little or no distinction between these guts, except that the latter, by an arbitrary division, is longer by one-fifth than the former.

The ileum then is the longest of the small (and indeed of all the) guts: it forms the greater part of that convoluted tube which lies principally in the umbilical region. Probably it is still less vascular, being somewhat paler, than the jejunum; it is certainly less in

circumference towards its posterior extremity, which ends, rather abruptly, in the beginning of the large intestines. The jejunum and ileum being attached to the spine by that extension of peritoneum called the mesentery, float about within the cavity, varying their situation and relative position with the volume of the stomach and stage of the digestive process.

The small intestines are supplied with blood by the *anterior mesenteric artery*, a vessel of large size, that, after having divided and subdivided many times, sends off numerous small branches, which ramify to great minuteness between their muscular and villous coats. Their veins, which have no valves, return the blood into the vena portæ. The nerves come from the mesenteric plexus.

These intestines altogether will contain about eleven gallons of fluid.

Large Intestines.

The large intestines are shorter, but considerably more bulky, than the small; they also differ remarkably from the latter in their general appearance—in being puckered into numerous plaits or folds. This peculiarity is occasioned by some longitudinal muscular bands, which, being shorter than the rest of the intestine, pucker its coats—contract them into folds: to these bands are appended numberless little, fatty processes, to which anatomists have given the name of *appendiculæ pinguedinosæ*. Internally, the large intestine is divided into many little elliptical pouches, called *cells*, with partitions between them; which, though they appear to answer the same purpose as the valvulæ conniventes of the human intestine, *viz.* the retardation of the passage

of the aliment and the augmentation of the surface for absorption, differ essentially from them in being constituted of *all* the coats of the gut. In other respects, the structure of the large and small guts is not materially different.

The large intestines, like the small, are three in number, *viz.* the *cæcum*, *colon*, and *rectum*: they do not however bear the same degree of likeness, one to another, as the divisions of the small.

The *cæcum* or blind gut, the first subdivision of the large intestines, originates in a large capacious head or receptacle, called the *cæcum caput coli*, or blind head of the colon, from which it extends downward, and terminates in a blind extremity or *cul-de-sac*: from this part, in the human subject, proceeds a slender elongation of gut, about the size of a quill, denominated the appendix vermiformis. Before I proceed further in my description of the cœcum, I shall direct my attention to the manner in which the small are united to the large intestines. The termination of the ileum projects for some way into the caput coli, and does so at right angles both with it and with the cœcum, so that the contents, having once passed the ileum, are not likely to return; independently of this preventive contrivance however, there is a valve at this part very like that at the pylorus. This valve, which is called the *valvula coli*, is formed of a doubling of the internal coat, within which is folded a circular band of muscular fibres; in its shape it resembles a half-moon, so that it is not equally prominent at every part. Its office is that of permitting certain alimentary matters and all fluids to pass from the ileum, but to debar their return.

The cœcum differs from all the other guts, in having but one opening into it; consequently all matters that

have once entered it, must re-ascend into the caput coli in order to continue their route. The exterior of it is braced by three longitudinal bands, and puckered by them into three sets of cells internally; these cells, which are abundantly supplied with blood-vessels and absorbents, extend the surfaces for absorption and secretion, at the same time that they prolong the stay of the contained matters. The contents of this gut after death are generally found to be fluid; it would appear indeed to be the proper receptacle for fluids; for if we give a horse water, the greater part of it will flow at once through the stomach and small guts and collect within the cœcum. It will hold about four gallons of fluid.

The *colon* in the horse is a gut of enormous size, of a peculiarity of figure, as well as course, and is the most capacious and longest of the large intestines: it will contain about twelve gallons of water, a greater quantity than what all the small intestines will hold together. It begins in the cœcum caput coli, that voluminous dilatation of gut between the termination of the ileum and mouth of the cœcum, and soon expands into a cavity of greater dimensions than even that of the stomach itself; having attained this bulk it begins to contract, and continues to do so gradually during its course around the cœcum, until it has completed its second flexure, where it grows so small that it scarcely exceeds in calibre one of the small intestines; and though from about the middle of this turn it again swells out by degrees, it never afterwards acquires its original capaciousness: indeed previously to its junction with the rectum it once more diminishes, and at length assumes the calibre and general appearance of that gut. Its first flexure has three longitudinal bands, which give it a plicated appearance externally, like the

cœcum, and form it into very many deep and capacious cells within; its last turn however has only two, and the cells of it are not only less numerous, but are much shallower as we approach the rectum. This fact tends much to strengthen our opinion of the uses of these cells; for in this part of the alimentary canal the matters are found to be feculent, no farther absorption is required to be made from them therefore, and of course they need not be longer detained. Not only however are the cells fewer and less distinct at this part, but their supply of blood is diminished; so that the intestinal secretion, which it is believed contributes to the completion of the digestive process, is here probably wanting altogether, or but very sparingly produced.

At the upper margin of the pelvis the colon terminates in the rectum, in the horse a short and nearly straight gut, which is continued thence to the anus. It will hold about three gallons of fluid. This gut, independently of its general figure and dimensions, differs from the cœcum and colon in possessing but a partial peritoneal covering, and in having no muscular bands, nor cells. The extremity of the rectum, more capacious than the anterior part of it, is furnished with a circular muscle—the sphincter ani; which, with the adipose matter in which it is cushioned, gives that prominence to the anus so remarkable in the living animal. The use of the sphincter is, by keeping the anus closed, to retain the fæculent matter until so much of it be accumulated in the rectum as to create a desire to discharge it. So that the sphincter is a muscle that is in constant action, otherwise the fæces would be very often escaping, and so far it acts involuntarily; but in order to expel them, the animal has recourse to a voluntary power to the

muscular coat of the gut, (which is stronger than that of the other intestines,) aided by the abdominal compression principally of the internal oblique and transverse muscles.

The large intestines receive their blood from a vessel of much less size than that which supplies the small, called the *posterior mesenteric*, a branch of the posterior aorta, whose distribution is similar to that of the anterior. Their veins end in the vena portæ. Their nerves spring from the mesenteric pexus.

LECTURE XLIV.

On the Diseases of the Stomach.

THE horse is occasionally the subject of disorder in the stomach, which may be either of a functional or organic nature:—the one owes its generation to the kind and quantity of the food, or to some mis-management in feeding; the other arises from the presence of irritating matters, mechanical or chemical, within the villous or right extremity of the organ.

Very many of the medicines made use of in veterinary practice are of so virulent a nature that they are seldom or ever given in large doses without producing more or less inflammation of the villous coat of the stomach: the aloes in a common dose of physic almost always does it, whence the nausea and loathing of food that so generally result from its administration; blue vitriol, corrosive sublimate, arsenic, verdigrease, &c. have a similar but more potent effect. Now, it is to the inflammation of the villous coat, (*gastritis,*) excited by an overdose or the improper exhibition of one or other of these poisonous substances, that I shall at present confine my observations.

The symptoms occasioned by the sudden presence of poison in the stomach, supposing it to possess the

common corrosive or caustic properties of the metallic salts I have just mentioned, or of the mineral acids or caustic alkalies, will vary with the quantity or activity, but not much with the specific nature of the substance introduced; but, should the poison have been administered for some time—medicinally, (for poisons are all innocuous when sufficiently divided or diluted,) or should it be of a vegetable kind, then the symptoms may and will vary to a very considerable extent. Without attempting to lay down the diagnostic signs by which any specific poison may be known to have been (clandestinely) given, which, were I prepared for such an undertaking, would take up far too much of my time and space here, I shall portray the leading symptoms resulting from the abuse of arsenic, corrosive sublimate, and blue vitriol, since they are the most common and almost the only substances likely to be so administered. The first symptom is nausea—the horse refuses his food: the experienced practitioner, aware of this, when he is prescribing a medicine the efficacy of which is doubtful or unknown, is always on the watch for failure of the appetite. This state of nausea is often accompanied with a copious flow of saliva—he froths at the mouth. Upon this fever quickly supervenes, followed by the expression of acute pain in the bowels:—the horse paws, turns his head round and looks with extreme distress at his flank, lies down, rolls about the stall, rises up again in great agony, breaks out into a profuse perspiration, and respires very quick and with painful embarrassment. The pulse at first is simply accelerated, it then becomes contracted almost to a thread, and at length quite imperceptible. Great prostration of strength now seizes him, he reels about in attempting to walk; he either passes

copious evacuations, or he has a painful *tenesmus* and voids nothing but mucus; cold sweats break out; he grows delirious from torture, throws himself down with excessive violence in the stall, becomes convulsed and dies.

In cases of death from the mineral poisons, the villous coat of the stomach generally exhibits a partial, but intense inflammation, which will of course vary with the virulence of the poison, and the length of time it has been administered: there are red, purple, or black patches, or some of each, upon its surface, it is thickened, and perhaps covered with flakes of lymph; it may also be ulcerated in places, or it may be gangrenous. The cuticular coat, though it is not susceptible of any vital action, is now and then spotted with black eschars from the caustic nature of the poison. The small and sometimes the large guts are also highly reddened in various parts; and where arsenic has been given for several days, the cœcum and colon are not infrequently found black and rotten—gangrenous: one of the best tests however of arsenic having been given is the very offensive fetor that is perceived from the liberation of gas, instantly the bowels are opened.

Unfortunately for the veterinary surgeon he has no means by which he can excite the immediate ejection* (by vomiting) of the noxious matter from the stomach. His only alternative, and it should be as promptly practised as possible, is the dilution of the offending matters taken in: let the horse be copiously drenched with warm

* I think that the newly invented stomach syringe may prove of great service to the veterinary practitioner in this case, and in some others: there is no more difficulty in passing a hollow flexible tube into the stomach than there is in introducing a common probang.

water, for he will seldom drink any at this time, or some oily or mucilagmous fluid; though I do not know that these last possess any advantages over simple water—that first obtained is always the best. The practitioner should endeavour to detect the nature of the poison swallowed; though, if it be arsenic, little or nothing can be done by way of rendering it innocuous, excepting free dilution. In the case of corrosive sublimate however, albumen or whites of egg are recommended strongly by ORFILA as antidotes. At the same time, we ought to draw blood very freely, blister the belly, and at short intervals throw up copious clysters. It is a most desirable object to induce and promote a free discharge from the bowels; but I fear we have no medicine that can be confidently administered with that view but what would itself prove a fresh irritant to the inflamed or ulcerated alimentary passages.

The horse is occasionally the subject of disease in consequence of preter-natural distention of the stomach, either by food or air. Mr. BRACEY CLARKE in his "*Essay on the Gripes*" has detailed a case of the former, which he calls "*coactio*, or gorged stomach*."

* A brewer's horse, that had at times been the subject of indigestion, was taken very ill in the dray, staggering about and endeavouring to lie down, in which painful condition he continued out several hours. When he came home, "he pawed now and then with his fore feet, but not violently, lay down, and after a few minutes resting, got up again; his breathing was agitated, but not violently so, his eyes fixed and staring, and watery, expressive of internal suffering. He passed the night much in the same manner, (having by Mr. C.'s directions had *warm beer* and *ginger* given to him;) "in the morning the gripe tincture was administered, and he was bled, which seemed to relieve him very much, his symptoms all returned however, and his breath and saliva, which frothed out

Of distention from air (*tympanites ventriculariis*) and consequent death, I myself, in this last summer, met with a very interesting case. Oxen, cows, and sheep, from being permitted to graze voraciously in luxuriant pasture (especially of young clover) not infrequently have the paunch blown up with air, in consequence of an over-distention with, and subsequent fermentation of, the succulent food; I have examined but one case of it however among horses. In cattle, it is called the *hove**.

of his mouth, became very offensive, and I then began to suspect it was a case of gorged stomach. He died on the fifth day after the attack; opened, his stomach was found unusually distended with food, which he could not digest." (Clarke's *Essay on the Gripes of Horses*, p. 21.

* On the 5th of September, 1823, a young bay mare belonging to the Artillery was admitted into the infirmary with symptoms of colic, for which she had lost lbxij of blood before she came in. Her symptoms were of the most violent and alarming description. She sweated profusely from paroxysms of agonizing pain, worked hard and quick at the flanks, and had a thready and almost imperceptible pulse. The following drench was prescribed to be given immediately.—Tinct. Opii et Ol. Terebinth. aa ℥ij. Decoct. Aloes ℥vj. M. In the course of half-an-hour this was repeated; but shortly after she vomited the greater part of it by the mouth and nostrils. No relief having been obtained, lbxij of blood were taken from her, and this drink given. Tinct. Opii ℥iv. Decoct. Aloes ℥vij. Ol. Carui ℥ß. M. a stimulating embrocation rubbed upon the belly, and large and frequent clysters injected. In another hour this drench was repeated, and, for the fourth time, during the succeeding hour, both of which, before death, she rejected as she had done the second drink. Notwithstanding these active measures were promptly taken, she died about three hours after her admission. Having opened her, we found the stomach prodigiously distended with air, it was, at least, three times its ordinary size. When punctured, it subsided to about two-thirds of its former bulk. It contained masticated oats and hay, swimming in a greenish yellow fluid, which emitted an offensive

Lastly, the stomach may be ruptured. Mr. CLARKE's Essay furnishes me with this account of a case of it. — "*Chordapsus, ruptured stomach.* When the stomach ruptures, its contents pour from the nose and mouth; I never saw a case of this kind, but I record it from the report of my esteemed friend, FREDERICK NASH, who was present at a case of this sort when living at Cambridge. Death immediately follows *."

On the Diseases of the Intestines.

THE intestinal canal of the horse, like that of the human subject, is occasionally the seat of inflammation, either acute or chronic, and of spasm; it also now and then becomes obstructed, or partially so, by calculous and stercoraceous concretions. The acute diseases to which it is liable, run their course with great rapidity, being in general more speedily fatal than those of the chest. And they not only demand the utmost vigilance and activity on the part of the practitioner, but call in an especial manner for the exercise of his judgment; for the issue of the case often hangs by a thread, and that thread is broken if his decision prove to be erroneous. I will venture to affirm, that in no instance are the remedies of the *soi-disant* veterinarian so cruelly misapplied as in the one before us.

Inflammation may invade the peritoneal, muscular, or mucous coat of the guts: of the first (*peritonitis,*) I have already spoken; of the second (*enteritis,*) I shall now give an account, and shall follow it up with one of the third. (*diarrhœa.*)

odor. Had we suspected the presence of air, we would have attempted to have introduced a flexible hollow tube into the stomach

* CLARKE's *Essay on the Gripes.*

Enteritis.

This disease consists in an inflammation of the *muscular* part of the gut; it differs therefore in its seat, and, as we shall hereafter learn, in its characters or causes, from the other two, more particularly from diarrhœa. Among others who have written on this disease, I observe that Professor Peall entertains a different opinion of its seat *. I do not deny that the peritoneum, or even the mucous coat, may participate of the inflammation, but I aver that the *substance* of the gut, *i. e.* what intervenes between the peritoneal and mucous coats, the muscular and cellular structure, is primarily and principally affected. Slit open the intestine after death, and you will perceive but little or perhaps no reddening of its interior though the exterior resembles a piece of scarlet velvet; even this however is but an illusion; for if you strip off the peritoneum, you will find that membrane still transparent, or scarcely bloodshot; whereas, had it been the part principally diseased, it would not only have been intensely red and opaque in itself, but have left the tunic underneath comparatively white. Acute peritonitis then is a distinct disease from enteritis; and, although we have no infallible symptom of discrimination, we shall rarely or never give a false diagnosis if we remember that the former is the result, almost always, of particular local

* "The horse's bowels, moreover, are subject to *two* distinct species of inflammation. One is comparatively mild in its nature, being confined to the villous or internal coat &c. The other affects the peritoneal coat of the intestines, is highly dangerous in its nature, and is almost always attended with a costive state of bowels." Page 184.

causes: in fact, I never knew it to be an idiopathic affection. As far as regards these affections however, diagnosis is but of little importance; both, in the acute stages, require the same remedies, and the same active employment of them: their course is alike rapid, and their tendency equally fatal.

Should we perchance be led to examine the horse a little before this disease has manifested itself, we may generally detect such febrile symptoms as usher in most of the other acute inflammatory affections:—such as dulness, loss of appetite, shivering, erection of the coat, and actual coldness of the ears and legs, succeeded by heat of skin, dryness of mouth, frequency of pulse, and short and quick respiration. But in the majority of cases we see nothing of our patient prior to the accession of what may be called the essential symptoms. The horse, apparently in excessive pain, paws, occasionally strikes his belly with his feet, lies down, and, having rolled once or twice upon his back and stretched himself along the stall in great agony, quickly rises again, turns his head round from time to time, and looks with wildness and extreme anxiety at his flank, and groans; his bowels are constipated, his belly is tense and tympanitic, and his pulse is a hundred, is small, and has a remarkably sharp beat under the fingers. With respect to the constipated state of the bowels, we may be misled at the onset of the disease from the occasional passage *per anum* of some hardened dark-colored fæces; but these are only some that have been lodged in the canal posteriorly to the inflamed parts, which, from the irritation they now create, become discharged. The tension or tympanitic state of the abdomen is not only perceptible to the feel, it may be demonstrated by com-

paring the present circumference of it with the girt of the surcingle which the animal is in the habit of wearing.

These symptoms, unless some relief be speedily afforded, assume a more alarming character. The animal becomes exceeding restless, he is up and down every minute, breaks out into profuse sweats, groans and casts a painfully expressive and cadaverous look at his flank, no pulse can be felt, either at the jaw or the side, and the respiration, which is now even quicker than the pulse becomes so short and distressing to him that we imagine every puff he makes must be his last: cold sweats bedew his coat, he groans and plunges with agony, delirious he casts himself headlong in the stall, is seized with violent struggles as he lies, and having raised his head twice or thrice to his side, suddenly stretches himself out, gasps, and expires.

I said before, that it was not of importance to inquire whether such symptoms belonged to enteritis or to peritonitis, as, in either case, I should pursue the same treatment; it is not so however with regard to colic or gripes, with which we are also likely to confound this disease: such a mistake would subject our patient to a course of remedies of so injurious a nature, that it would have been truly fortunate for the suffering animal if we had not been called in at all. I shall give the diagnosis in speaking of colic.

Great stress has been laid on the fatal effects of cold in producing this disease; but, for my own part, I have little hesitation in saying, that of all other causes it should be named last. Were I to turn a hundred horses out into a strawyard during the winter, that had been habituated to warm and comfortable stables

I should not anticipate that one would have an attack of enteritis. The most common excitants of it are excessive and long continued exertion, and that occasional, high and irregular feeding, and irritations and obstructions of various kinds in the bowels. If a horse be galloped so as to distress him exceedingly in his respiration, what is called *blown*, the mischief likely to result will be of a pulmonary nature; if, on the other hand, his course be such that he retains his wind, though, at length, he becomes exhausted from the continuance or repetition of exertion, we may be apprehensive of inflammation of the alimentary canal. Horses high-fed and but occasionally worked, are subject to irregularity in their alvine discharges, and to habitual costiveness, and this predisposes them to an attack of enteritis. Calculous or other indigestible matters, as well as an accumulation of hardened fæces, may prove the exciting cause, by obstructing the passage or irritating the lining of it: in the latter case it is obvious that any concussion of body, or violent action of bowel at the time, may induce the irritation. Intrusception, of which I have seen one instance, may produce it; strangulation, or a twisting of the gut, may cause it; and, for I do not *deny* the fact, in some cases, cold.

Pneumonia, though comparatively a rapid disease in the horse, is not, generally speaking, near so quickly fatal as the affection now under our consideration: frequently the animal will fall a victim to enteritis in the course of a very few hours from its apparent onset. We are not only therefore to follow up with more than ordinary alertness any secondary means that may tend to give a check to it, but, unawed by the apprehensions of

those around us, pursue a determined mode of practice from the very beginning. With a lancet or a large phleme make a free opening into the jugular vein, and thence detract, should the symptoms be urgent, two or even three gallons of blood, according to the size and strength of your patient: one circumstance alone ought to induce you to pin up the neck before this quantity has flown; and that is, the approach of something like fainting, indicated by the animal's reeling, or being likely to fall, from sudden prostration of strength. The questions you are now to put to yourself are, what are the best means to produce speedy and copious evacuations?—are there any purgatives that I can employ for this purpose?—and what are those purgatives? The common *ratio medendi* shows us, they should be such as will least offend the bowels already under excessive irritation. Professor PEALL prescribes one quart of castor oil, and adds, "This is the *only* medicine that can with safety be exhibited by the mouth in this disease." Certainly aloes, and the croton oil, being drastic purgatives, seem, as such, liable to objection; but I cannot agree with the learned Professor, that aloetic medicines "operate as a poison" here, nor do I see the same objection to the neutral salts, could any of them be depended on as purgatives (which, as far as my knowledge of their effects extends, they cannot*) that he appears to insinuate.

With respect to castor oil, I shall hereafter show, as the result of my experiments, that it is extremely uncertain in its effects, and that its operation, even in a healthy subject, is not unattended with danger; for

* Vide Lecture "On Purgation and Purgative Medicines."

which reasons I must enter my protest against its administration altogether. Seeing then that we have no purgative of that *mild* nature which, it is the opinion of most professional men, is a *sine quâ non* in this disease, I must dissent from the *established rules of practice* and recommend *aloes*: rather indeed than let my patient die with unopened bowels, I know of no certain purge that I would not give, nor feasible measure I would not have recourse to. But, wherein consists this dreaded evil? Human physicians of the greatest note are in the habit of giving calomel and colocynth, and why should not veterinary surgeons give aloes in enteritis? It is not the villous but the muscular and cellular structure that is the seat of disease; and therefore we are not, as we have been led to imagine, applying the aloes to an inflamed surface; and even if we were, are we quite certain that it is more irritating than castor oil, or neutral salts, or any other medicine we may employ! But I would exhibit the aloes in solution, and for three reasons:—first, because its operation is thereby likely to be accelerated; secondly, with a view of rendering it less irritating; and lastly, to purify it*. Calomel, as a purgative, is not only a very uncertain but a very unsafe medicine, and as such is unavailable in any case; but, if the aloes did not answer my expectations, I should not hesitate to prescribe the croton seeds †.

Copious clysters are always to be often injected, *raking* ‡ having been first performed; they may be composed of soft soap and warm water, and rendered

* The formula will be found in a note at page 194, Part I.

† Vide Lecture "On Purgation and Purgative Medicines."

‡ By *raking* is meant, the manual operation of removing scybala from the rectum.

more stimulant by the addition of common or epsom salt, or of a small quantity of aloes. Did these injections fail to procure evacuations, I would throw up the tobacco enema * : Mr. W. Goodwin tells me that he has employed fumes of tobacco in one case with apparent benefit.

As soon as we have bled our patient, administered to him from ʒiss. to ʒij. of aloes in solution, raked him, and given him a clyster, we may make an attempt to foment the abdomen with hot water ; but this is rarely practicable when the symptoms are violent. We are recommended by some also to wrap the belly in recently flayed sheep's skins ; but even if they could always be procured, they cannot in all cases be kept applied ; and when they are laid on, I am inclined to think that their efficacy amounts to very little. To these emollient means, I prefer myself counter-irritation. Here again has arisen a variance in practice. One would think that no man of experience would insert a rowel or a seton in a horse that, if he be not relieved by the third or fourth hour from the attack, will be, in all probability, past recovery ; in the first place it can have no effect in the time, and in the second it never will discharge so long as the system is harrassed by violent inflammatory action. Counter-irritants should be such as will take speedy or immediate effect ; and one of the best consists of equal parts of ol. terebinth. and infus. lyttæ. Without cutting off any hair, let from six to twelve ounces of this mixture be well rubbed over the surface of the belly, and when the extremities are cold, I am far from condemning their practice who direct that about one-fourth of that

* ℞ Aq. Fervent. Cong. i.
Fol. Nicotianæ ʒiv.
Infus. per horam et cola.

quantity be rubbed upon the legs. When the symptoms are extremely urgent, Professor PEALT, in my opinion with much feasibility, recommends firing the abdomen with a broad and flat, or slightly concave iron, so as to produce considerable inflammation without the hazard of sloughing the integument. As a powerful stimulant, the mustard poultice may be rubbed in * ; and, last of all, should the abdominal surface still remain cold, and the bowels constipated, boiling water may be dashed upon it.

I have said nothing about a repetition of venesection ; that must be left to the discretion of the practitioner, whose surest guides are the pulse, the expressions of pain, and the apparent strength of his patient.

With regard to regimen, the animal ought to be warmly clothed and have his legs bandaged with flannel, so as to determine blood to every part of the skin, to be let loose in his stall, or what is better, in a box, and to be littered down. His food should be liquid, or, if solid, soft and very digestible ; such as water gruel, linseed tea, bran mashes, and arrow root. Corn or hay, under these circumstances, might aggravate the disease by passing indigested into the intestines.

The most common termination of enteritis, when it proves fatal, is in a state bordering upon gangrene ; or in an intense reddening of the guts, streaked here and there with dark or black patches. In the human subject it sometimes ends in suppuration, but I have not met with any collections of pus in the bowels of the horse.

* ℞ Pulv. Sem. Sinapis ℔j.
Acet Calid. q. s. ut ft. cataplasm.

LECTURE XLV.

Diarrhœa.

DIARRHŒA, in vulgar language called *flux*, *looseness*, *scouring*, &c. consists in copious liquid evacuations from the alimentary canal. I might perhaps, with more propriety, have entitled this part of my lecture *dysentery*; for I believe it is to this form of disorder that horses, as well as cattle, are more particularly subject.

Diarrhœa, strictly speaking, originates in an inflammation of the lining membrane of the *small* intestines, whereas dysentery consists in an inflammation confined to that of the *large*, and principally to the colon. I think that we, who are acquainted with the structure and functions of the alimentary canal, need not be at a loss to explain why the horse, and many other grammivorous animals, should rather have dysentery than diarrhœa, and more particularly why the former should, in whom we know that the disorder too often owes its origin to the abuse of purgative medicine. If in my description I appear to glance at dysentery as it invades the human subject, I wish it to be understood, that I make no allusion to the *contagious* nature of the malady, if such it ever actually assumes; though

this affection, like many others, may become epizootic among horses and cattle, where great numbers of them are exposed at the same time to the influence of the same exciting causes. Every sheep in a flock will be simultaneously attacked with the *scours*, the effect of pasture, situation, season, &c. but not of infection or contagion, for if they be turned with others in a place remote from the influence of the exciting causes, they will not communicate the disease, but, on the contrary, speedily get well of it themselves.

Horses, like cattle, grazing in marshy pastures during the cold season, or exposed in particular situations, become subject to dysentery; not having been in the habit however of seeing the disease thus propagated, I can offer none but general remarks upon this species of it at present. For the majority of the cases of flux that are brought to us we are indebted to the groom, the farrier, and the stable-keeper, who used to kill many horses formally by literally purging them to death. Thirty years ago, an ounce and a half or two ounces of aloes, occasionally combined with one or two drams of calomel, composed the common purge; and, even now, among these people, nine, ten, and eleven drams are by no means unusual doses. Young horses, purchased at the country fairs, that have been previously pastured perhaps, arrive in the metropolis after a journey of many days, which has pulled them down in condition and debilitated them: a few days—ay, probably the very next day, after their arrival, they are all *physed*—they have given to them indiscriminately doses of aloes every one of which would be sufficient to purge two of them; the result is, that the light-carcassed irritable subject is carried off at once by super-purga-

tion, while another or two may linger in misery and pain from a dysentery that will end in gangrene and death, or be rendered more speedily fatal by the doses of opium, or some other powerful astringent, which are so perniciously resorted to on these occasions. There is another, not uncommon cause of this disease, and that is, continued and excessive exertion. After having been hard ridden for many hours, a horse will often express irritation in the bowels, by frequently voiding his excrement, which will be found to be enveloped in a slimy or mucous matter; or this matter, which is no more than the intestinal secretion, may be discharged by itself, and in that state, from its being supposed to be fat melted by the heat of the body, is by the farriers called *molten grease*, under which head are to be found in many works on farriery the most absurd accounts of it: this variety I believe to be one in which the diseased action extends through the small intestines. I do not deny that vicissitudes of temperature may produce dysentery, but I cannot help thinking that cases of it are comparatively rare. That particular kinds of food, more especially those of a green and succulent nature, will occasionally excite a flux, is well known to us all; indeed, the most speedy and effectual way of producing it, would be to feed a horse on green meat, and put him to hard work. This disorder, for aught I know, may now and then proceed from some alteration either in the quantity or quality of the bile; this however is but a speculative opinion of my own, I have no recollection, nor at present any record by me, of such a case.

I have said that flux in horses more commonly partakes of the nature of dysentery than diarrhœa; my own

dissections, as far as they have gone, bear me out in this assertion; independently, however, of such proofs (which by the bye are the only ones worthy of our reliance) a bare consideration of the exciting causes would incline one to a belief that this opinion was correct. Aloes, we shall find, acts principally upon the large intestines; and hard riding appears to induce purging, either by hurrying the alimentary matters, before they are sufficiently digested, into the large guts, where they ferment and create irritation, or by causing direct irritation during the act from unnatural friction and over-excitement in the bowels. The comparative importance of the large guts in fecation, and the length of time the aliment remains in them, may also assist us to account for their greater liability to this disorder.

In treating this malady, whether we suspect its chief seat to be the small or the large intestines, of which we may probably form pretty accurate notions by informing ourselves of the apparent exciting causes, paying close attention to the symptoms present, and often inspecting the excrement, we are to bear in mind that, in generality of cases, it is an effort of nature to get rid of some offending matter from the alimentary canal, which has excited more or less irritation, inflammation, or ulceration there. This being the case, the indications in the treatment are three:—first and chiefly, we must undertake the expulsion of the noxious matter; secondly, we have to moderate the consequent irritation and inflammation; thirdly, we have to repair any injury that may have been occasioned by it. Should an over-dose of aloes have been the cause, we are to *encourage* the purgation, (for this is Nature's effort to dislodge and discharge the offending agent,) and endeavour to shield the tender villi from its irritant

properties, by giving the horse plenty of barley water water gruel, or linseed tea. At the same time we are to keep within proper bounds any accompanying fever or other symptoms that may indicate inflammation in the bowels, by bleeding, fomenting, and blistering the belly, and producing diaphoresis, or an approach to it, by keeping the skin as warm as possible. Opium, and astringents and cordials of all descriptions, are at this period pernicious in the extreme. With regard to diet, we are to convey as much aliment as we can in a liquid form, as gruel, &c. Whatever provender is given to the animal should be such as can be easily digested, and is not likely to run into fermentation. Grain and pulse bruised may be sparingly fed with. All sorts of green meat, and I think hay also, ought to be scrupulously abstained from. But give the animal as much sustenance in a liquid form as he will take, and offer it to him every hour in the day. This is the only rational mode of treating recent cases, either of diarrhœa or dysentery; if they be but slight, attention to diet, and promotion of the discharges, are all they require; if violent and accompanied with fever, the other means I have recommended, must be resorted to, one or all of them, at the discretion of the practitioner. In cases where there is much mucus ejected, or only scybala covered with mucus, and perhaps blood with it, the effect of hard riding, we may pursue the same practice, paying special attention to the introduction of bland, mucilaginous drinks. When green or succulent food has brought it on, the animal will derive benefit from the exhibition of alkalines, and the best is chalk; this substance is found of so much service to calves that I owe chiefly from its virtue in correcting acidity. In these cases large doses of the hydrargyret may

be tried; half an ounce or an ounce twice or thrice a day; or, what I have given with manifest advantage, small doses of calomel combined with chalk *. Should the flux continue, though the inflammatory and irritable state of the bowels has apparently subsided, at least in a great measure, we may venture upon the use of astringents; but even at this period, they will succeed best if combined or alternated with the above medicines; for it is not the purging itself that we are to direct our remedies against, but the cause of it, the inflammation of the alimentary canal and the vitiated state of its secretions: a want of consideration of this circumstance has led to much bad practice, which, I do not hesitate to say, has shown itself more in the treatment of these cases than of any other that occupy the attention of the veterinary surgeon. *Opium* is the best astringent we can exhibit; let it be given often and in small doses, conjoined with chalk †: others however may be made trial of, such as *catechu*, *kino*, &c.

Colic.

This disorder, also called *spasms*, *gripes*, *cramp*, &c. consists in a spasmodic contraction of some portion or portions of the intestinal canal. In my lecture on the anatomy of this organ, I shewed that it was a muscular part; it may therefore now and then, like other muscles, become the subject of spasm.

The symptoms by which colic is known are very like those of enteritis; I trust, however, I shall be able to

* ℞ Hydr. Subm. ℈j.
Pulv. Cretæ ppt. ʒiss.
Syr. Simp. q. s. ut ft. bol. mane nocteque exhibendus.

† ℞ Tinct. Opii ʒj.
Cretæ ppt. q. s. ut ft. bol. bis terve die exhibendus.

point out sufficient signs of distinction between them to safely direct the practitioner in his administration. An attack of gripes is most commonly quite sudden, the malady makes its appearance without any precursory or even accompanying febrile commotion. The horse is all at once seized with symptoms of extreme uneasiness and pain:—he paws, occasionally strikes his belly with his feet, lies down and rolls over, sometimes rolls upon his back, in which posture he continues for a few seconds, as if it afforded him relief; suddenly he rises up again, shakes himself, and casting a doleful look at his flank, expressive of the agony he suffers, seems to forewarn you of the approach of another paroxysm, which is commonly more violent than the preceding one. At the onset, the remissions or intervals of ease are generally well marked, but as the disorder advances the paroxysms grow more violent and longer in duration, and the remissions become shorter or are altogether wanting. The animal is continually rising up and lying down, he sweats profusely, he heaves at the flank, and evinces by his violent actions his heedlessness of what is doing about him, and by his wild, frantic eye, the acute and twitching pains he feels in his bowels. If the pulse be examined at the onset, during a remission, but little or no alteration will be perceptible in it; but, while the paroxysm lasts, it is contracted to a thread, nearly or quite imperceptible and quickened, and in the season of extreme pain and agony it undergoes great acceleration. The belly feels tense; and costiveness is mostly present. In concluding this account of its symptomatology, I wish it to be understood, that spasm is sometimes present as an effect of enteritis, and now and then itself terminates in that disease.

Remember then that of colic fever is neither a pre-

cursor, nor an early concomitant, *i. e.* there is little or no variation of pulse, no antecedent shivering fit, or other symptom of ill health; that its approach is not only quick, but generally sudden; and that all the symptoms of disturbance subside at intervals into a state of tranquillity and apparent freedom from pain, which they never do in enteritis. Some insist that the horse rolls upon his back if affected with colic, but never, or not so often, when suffering from enteritis, but, in my opinion, this is too vague and indeterminate a sign, by itself, to build a safe diagnosis upon: the animal will roll upon his back in enteritis sometimes, and so he will, I should imagine, (for I have no case in my mind, at present, that I could adduce in support of it,) in acute peritonitis.

That gripes do now and then supervene upon a copious ingurgitation of spring or cold water in hot weather, or when the animal is himself heated, every groom can vouch for; but that it is the result of suppressed perspiration, or of suddenly cooling the surface of the body when heated, is to me very questionable. No food is so likely to generate spasm as that which is disposed to run into fermentation: during the season that horses are fed on green meat, I have known the disease to be epizootic. Aloes now and then excites it by its irritating effects. Mr. Bracey Clark ascribes *a predisposition to horses to gripes from peculiarities in the conformation of their alimentary canal, and a consequent disturbance or suspension of chylification—to the application of cold to the surface of the abdomen—and to the shortness of the omentum and its thinness of adeps, whereby the guts, particularly the cæcum and colon,* ARE NOT KEPT SO WARM *as in animals in which it is of greater length.*

The proximate cause of colic is spasmodic constrictions of the small guts; at least, I have never seen them in the large. Professor PEALL however seems to regard them also as the seat of spasm; "for," says he, speaking of giving clysters, "the spasms of the *posterior* bowels become so violent and rigid, that no ordinary strength is sufficient to overcome their power." And in another place, the Professor observes that "clysters are essentially necessary, not only on account of the spasm, and obstruction in the bowels, but of another dangerous symptom, also, which is usually a concomitant in these cases; I mean *spasm at the neck of the bladder*, attended with a suppression of urine." This last is a symptom that, I must confess, has escaped my observation; I shall however for the future direct my inquiries to it: when present, for I apprehend that it is not constant in gripes, it becomes a question whether the catheter ought to be passed. In tracing the intestines of a horse that has died of this disease, from the stomach to the cœcum, we find parts of the canal, here and there, extremely contracted, as if a piece of broad tape had been tied tight around them: oftentime the contracted part will be three or four inches in breadth, and only divided by a sound portion of equal extent from another; and in this way I have seen many of them in the same bowels*.

So readily is spasm subdued or removed, in the gene-

* As the cases of gripes published by Mr. CLARK do not accord with the views here taken of the disorder, I shall subjoin an account of the appearances they presented *post mortem*.

The first is that of a horse who was seized with *gripes* during the night, and who died of it at noon. "I was desirous," says Mr. C. "to see him opened, and found *a most extraordinary thickening and inflammation of the cæcum*, as though a general rupture of the vessels and membranes of this intestine had taken place, and the

ruinty of cases, that there is scarcely any horse-dealer, farrier, or head groom, that would deign to receive in-

blood was lodged between its coats; the inside lining of the intestine was almost black, the outside comparatively but little inflamed. The intestine itself contained a great deal of ill digested and unmasticated food, of beans, oats, and ill chewed hay, mixed with a bloody water, or red serum, which had probably been thrown out from the distended arteries and vessels which at length were ruptured by the inflammatory action. The small intestines were not much affected; here and there a patch of inflamed surface."

"The second case I select" was one in which "the symptoms were the most violent, and the pain and inflammation went on in the most rapid way I had ever yet seen." The horse was taken ill at Islington and lived six hours after his return to London, during which time opium, fomentations, clysters, &c. were administered in vain. "We immediately opened him, and found the *colon and cæcum highly inflamed*, and an immense quantity of ill chewed, undigested food within, and a large quantity of greenish red water, and some air. Here the cause evidently appeared to be indigestion; and from the horse-keeper I understood he was a very voracious feeder, and had been several times seized in this way before, but not so violently."

In a third case which lived "longer by seven or eight hours" than either of the preceding, Mr C. "found that the *inflammation was not confined to the large guts, but the ileum and jejunum also were sufferers*, some balls of dung were found about the middle of the jejunum that had the appearance of *having undergone a strong compression*, and some of these balls appeared externally red with blood. The commencement of the colon contained a large portion (two hats full) of almost dry undigested grain and hay."—"I also observed a gangrenous patch, as large as my hand, on the colon, the *only* instance I recollect to have seen of it in the horse. *All the internal surface of the intestine was like a mass of red sponge, drenched and filled with dark grumous blood.*"

I agree with Mr C. that in these cases "indigestion was certainly the primary cause of the mischief," and it is evident that the mischief itself was inflammation, and as such they do *not* come under the denomination of *gripes*, according to the acceptation which I hold of that word. I take *gripes*, *colic*, and *spasms* of the

struction on the subject, or that has not some *nostrum* of his own of *infallible efficacy*. And, confining my observation to a genuine case of colic, they almost always succeed. for, the fact is, in many of the ordinary cases, whether any thing or nothing be done, the horse will, after having rolled and kicked in pain for an hour or so, and procured an evacuation or two, spontaneously recover. So that whether we give gin and pepper *, as they do in some parts of the country; or oil of turpentine, as is recommended at the Veterinary College †; or Mr. Bracey Clark's prescription, tincture of pimento ‡, or tinc-

intestines, to be one and the same disorder without *spasm* I have no conception of what *gripes* is. If we suffer ourselves to be led away by the vulgar the farrier's use of the word *gripes*, according to which it is indiscriminately applied to every horse that paws, lies down, and rolls and kicks about from pain, we shall find in the course of our practice that we have made *gripes* a very comprehensive *order*, under which we must not only range various kindred *genera*, but diseases of an opposite nature and tendency, affecting parts that have no connexion whatever, either in a healthy or morbid condition. Dyspepsia, colic, enteritis, peritonitis, hepatitis, nephritis, cystitis, in short, almost every acute and painful affection of the abdominal and pelvic viscera, as well as pleurisy and peripneumony occasionally, are all gripes to a farrier. It is lamentable and highly derogatory, that the profession is yet without a systematic nomenclature. Bracey Clark's *Essay on the Gripes of Horses.*

* Almost any pungent aromatic, and most of the diffusible stimulants, will answer the purpose quite as well, I believe.

† R Sprts. Terebinth. ʒij. ad ʒiv.'

Aquæ Tepid. ℔j. M. f. haust.

‡ Infuse ℔j of pimento in ℔ss of water and the same quantity of spirit, for several days; strain the infusion, or let it stand until it be required for use. Give four ounces of it, mixed with common or peppermint water, immediately, and repeat the dose in half an hour, and every succeeding hour until the symptoms be relieved. *op. ut. sup.*

ture of opium, which I myself prefer, the spasm will subside; though undoubtedly much quicker from some of these remedies than from others. And it is a duty incumbent upon us, to administer with as little delay as possible to the extreme sufferings of an animal thus affected: and for this purpose I recommend that three ounces of laudanum be exhibited in a pint of peppermint water*. My father is in the habit of prescribing two ounces of oil of turpentine in combination with half the quantity of the tincture of opium; and I am very much inclined to think that however efficacious the turpentine may be of itself, its operation, as an antispasmodic, is accelerated and rendered more permanent by the addition of opium. Professor PEALL has, in a laudable tone of humanity and sympathy, censured the practice of compelling griped horses to take exercise; but, though I am always inclined to be led by sentiments of compassion, which, as far as the temporary sufferings of the patient are concerned, are here in perfect unison with his, I must now restrain them lest they get the better of my judgment. For it is a practical fact, that many horses thus affected that are stimulated to take a brisk trot, are found, on being put into the stable again, to have ex-

* I have also given the following formula with success, and I intend to follow up the practice, as one that combines the most desirable *ultimatum* in these cases of *opening the bowels* after it has relieved the spasm, and thereby of counteracting the tendency to inflammation.

℞ Decoct. Aloës ℥xij.
Tinct. Opii ℥ij.
Ol. Carui ℥ß. M.

The formula to make the decoction will be found in a note, at page 194, Part I.

perienced so much relief from it that another paroxysm has not returned, though the fits were incessant prior to their having been taken out. The common practice is to give the animal his drench, and then direct the groom to get upon him and trot him briskly for a few minutes, after this to walk him, and then renew the trot. The drink ought to be repeated every half-hour. While the horse is in the stable, the belly should be well rubbed with a hard brush, or with the handle of the broom, or any suitable thing that happens to be on the spot.

We shall seldom have occasion to repeat the drench more than twice or thrice, for, what may be expected in the majority of these cases, if the spasm be not removed in the course of a few hours, is the accession of inflammation; which, as I stated before, may either supervene upon spasm, or be the fore-runner and producer of it. Knowing this then, we should narrowly watch the symptoms, and be on our guard against the approach of enteritis, in order that we may lose no time in flying to another class of remedies. If e.g. we find the pulse getting up, and increasing in perceptibility and strength, we had better, without delay, take away a large quantity of blood, indeed many practitioners bleed in cases of simple gripes, and although the practice cannot be justified so long as stimulants and opium are deemed requisite, it is far from being condemnable, for to use their own argument, "it can do no harm and may be productive of good:" venesection itself being an antispasmodic. But should inflammation have manifested itself, we are immediately to betake ourselves to that catalogue of remedies recommended in enteritis, to the exclusion of our antispasmodics; for, if any symptoms of spasm still remain, we must look upon them as consequent upon in-

flammation, and to the abatement of that devote all our subsequent measures.

It is the common practice with those who rest content with the antispasmodic effects of the oil of turpentine, to give a few balls composed of solid turpentine—the terebinth. vulg. after all symptoms of spasm have vanished, in order to *prevent* a relapse. With equal reason, it strikes me, might we ourselves take mercury to prevent the recurrence of the venereal disease, or cubebs pepper to guard against gonorrhœa; unfortunately for us, as well as for our patients, that which cures has not the virtue of prevention, otherwise the consumption of medicine would probably be much greater than it now is, and the prevalence of disease considerably less.

On Calculi, and other Concretions, found in the Intestines.

Calculous, or other extraneous matter now and then collects within the guts; we commonly find it in the large—in the cœcum or colon. The shape and appearance of intestinal calculi, which vary much, will depend on the nature of the foreign substance taken in, and the situation in which it afterwards collects; there is one other circumstance however which will frequently regulate their shape, and that is, the figure of the central piece upon which the earthy matter is deposited: *e.g.* if the nucleus be round the calculus will be round, generally speaking; and we have a calculus of the exact shape of a horse-nail in consequence of a stub * being its nucleus. Others, however, do not appear to possess any nucleus at all; or, at least, if there be one, it is of

* Nails that are useless in shoeing, from having lost their points, are called *stubs*.

the same composition as, though firmer than, the substance of the calculus itself, and many of these calculi take on the general figure of the cavity in which they happen to be lodged: such found in the colon, unless they be of very large size, are lobulated—shaped exactly like so many balls of dung. The concretions commonly met with, are of an earthy composition, stratiform, like the concentric lamellæ of an onion, very hard, and bear some resemblance in their external appearance to a common pebble; others are soft and of a less compact texture; and a third kind appear to be composed of indurated fæces, and of hay, corn, straw, &c. imperfectly digested, all which seem to have been agglutinated together by the intestinal secretions: they are denominated *dung-balls;* and indeed very properly so, for they contain but little, if any, other than stercoraceous matter. A fourth kind are found, but they are not common, composed principally of hair; they are oftener seen in cows, those animals being in the habit of licking their coats. Calculi vary no less in magnitude and color than in shape and composition. Some are of very large size: we have them from eight inches in diameter to the diminutiveness of the smallest pebble; and from forty ounces in weight to as many grains. Most of our specimens are white, some red, many incline to the color of the dung, and others are of a very dark dirty hue. Why the horse, beyond other animals, should be so subject to have concretions of this nature, may be readily answered, by saying, because no other animal, that we know of, swallows so much calcareous matter. Horses under certain circumstances will actually lick up and eat the earth they tread upon:—when they are piquetted at

camp, and are only allowed a sparing ration of provender, they will frequently, from craving after food, not only tear up every dirty weed within reach, but eat the roots and then the dirt itself. There are other horses, who when turned out, although they are well fed, will pick up various indigestible substances they find in their range, gnaw the fences, swallow pieces of wood, or even nails, all which may afterwards become the nuclei to calculi. Independently of all this, however, we are to remember that the horse, although a nice-feeding animal in general, does actually take in much extraneous matter, such as dust, small pebbles, &c. with his provender, particularly when he is fed upon corn not well cleaned or sifted, and certain inferior kinds of hay: whence it arises that millers' horses are very subject to calculous collections, who are fed upon meal, which, I believe, often contains small particles of the grind-stones. The lodgement of these concretions within the intestines may operate in producing death in three or four different ways. They may excite spasms in the guts, and thus occasion an irrelievable attack of colic; or they may, by irritation, excite enteritis, and thus prove fatal, or they may obstruct the passage of the alimentary matters, and produce inflammation and gangrene of the gut. Of this last we have an excellent specimen in a preparation of the colon; and Mr. W. Goodwin has met with an instance of it in the *small* intestines.

I know of no symptoms by which the presence of a *calculus* in the intestines is indicated with any degree of certainty; unless perchance we should detect any calcareous matter, or small stones, mingled with the fæces, should we suspect, however, the presence of one, we

may, with some prospects of dissolving it, give large doses of either acids or alkalies, according to the supposed composition of the calculus, and follow them up with occasional doses of purgative medicine. Long and irrelievable constipation of the bowels is the natural consequence of an obstructed passage, and such a symptom may lead us to suspect there is some concretion in it, but of what nature we have no means of ascertaining. Mr. King, V. S. at Stanmore, related a case to me of a horse that passed nothing *per anum* for thirteen days having reason to believe that this arose from some stercoraceous collection, and seeing that the animal must inevitably die unless it were removed, he made an opening into the flank, introduced his hand, and, feeling a hard swelling through one of the guts, broke it down by compression. This operation was followed by copious feculent discharges: but the animal had previously sunk, past recovery.

LECTURE XLVI.

On Worms.

HAVING proceeded thus far in my observations on the diseases of the stomach and intestines, I am called on, in conformity with custom, to take up the consideration of the subject of worms; whether as a disease, or not, will best appear in the sequel of this lecture. By presumptuous dabblers in veterinary practice, they have ever been, and are still regarded as destructive vermin, a notion to which we may refer those vulgar prejudices of the present day that associate an utter dread and abhorrence with the idea of worms *crawling alive* within an animal's bowels, which prejudices have in no few fatal cases been made the ready instruments of the consciously ignorant farrier in repressing the inquisitiveness of his employers, and putting an end to all further inquiry after the cause of his unfortunate patient's death.

Four kinds of worms have been seen within the bowels of horses: *viz.* the *æstrus* or bot; the *lumbricus teres* or long white worm; the *ascaris* or small, thread-like worm; and the *tænia* or tape worm.

Bots.

The bot, an animal whose *nidus* or natural habitation appears to be the stomach, is so well known in its general characters to every one who possesses any acquaintance with horses that I do not conceive that a description of it is wanting here: I shall therefore commence with its natural history. And here I beg to offer my small tribute of praise for the acknowledged services rendered to the art, in this department of science, by that learned member of it, Mr. Bracy Clark, to whose pleasing essay on the subject I am indebted for this part of the present lecture.

Mr Clark has exposed the erroneous view that was formally taken of the bot in regarding it as a *worm*; he has demonstrated to us that it is the *larva* or caterpillar of a particular species of the genus *æstrus* or gad-fly. He has particularized three species of bots, they however are rather distinguished from one another by incidents connected with their natural history than by any specific corporal characters. The first is the *æstrus equi* or large spotted horse-bot, the most interesting of the three to us in this country, the second is the *æstrus hemorrhoidalis* or fundament bot; the third, Mr. C. has named the *æstrus veterinus* or red bot. Although I shall make many extracts as I proceed, my limits will by no means admit of my regularly accompanying this industrious author through his curious details, and even if they did, I should still conclude my remarks, by prescribing for the veterinary student the gratifying task of perusing this small volume himself*. Speaking of

* *An Essay on the Bots of Horses and other Animals.* By Bracy Clark, F.L.S. and V.S.

the GASTRUS EQUI, Mr. C. says, "As it is necessary to break into the circle of its history at some point, I shall begin with an account of the egg, and its deposition upon the skin of the legs of the horse, which is done in the following remarkable manner: When the female has been impregnated, and the eggs sufficiently matured, she seeks among the horses a subject for her purpose, and approaching him on the wing, she carries her body nearly upright in the air, and her tail, which is lengthened for the purpose, curved inwards and upwards: in this way she approaches the part where she designs to deposit the egg, and suspending herself for a few seconds before it, suddenly darts upon it, and leaves the egg adhering to the hair: she hardly appears to settle, but merely touches the hair with the egg held out on the projected point of the abdomen. The egg is made to adhere by means of a glutinous liquor secreted with it. She then leaves the horse at a small distance, and prepares a second egg, and, poising herself before the part, deposits it in the same way. The liquor dries, and the egg becomes firmly glued to the hair; this is repeated by these flies till four or five hundred eggs are sometimes placed on one horse." The parts chosen for the deposition of these eggs are those liable to be licked by the tongue, the inside of the knee is a favorite spot, and next to this, the side and back part of the shoulder, and less frequently the extreme ends of the hairs of the mane. Now the common notion is, that the *ova* are licked off the skin, and thence carried into the stomach; but Mr. C. observes, "I do not find this to be the case, or at least only by accident, for when they have remained on the hair four or five days, they become ripe, after which time the slightest application of warmth and mois-

ture is sufficient to bring forth in an instant the latent *larva*. At this time, if the tongue of the horse touches the egg, its *operculum* is thrown open, and a small active worm is produced, which readily adheres to the moist surface of the tongue, and is from thence conveyed with the food to the stomach." And it appears, that the irritations of the common flies is the instigation of the animal's licking himself; not however that this is absolutely necessary, for "a horse that has no ova deposited on him, may yet have bots, by performing the friendly office of licking another horse that has." The larva or worm, being hatched and lodged in the stomach, immediately clings, by means of its *tentacula* two dark brown hooks, between which is its mouth to the cuticular coat, which they pierce, though they never insinuate their points into the muscular or sensitive tunic beyond it: in this manner, so pertinaciously does the bot adhere that in our attempts to unhitch it, it will frequently suffer its hooks to be broken, or even its body severed, rather than quit its hold. Now and then, but I believe very rarely, they are found hooked in the villous coat; these however are nothing more than stragglers, bots probably that had, on their arrival in the stomach, been hastily carried with the aliment into its vascular part, before they had the power of fixing their hooks into the cuticular. Here, then, is a fact which ought to stifle our apprehensions about the pain and irritation that these animals are said to occasion; how they can cause either, when they are fastened to an insensible part, to a part as devoid of feeling in itself as the very hoofs are, I have yet to learn. The bot thus transported about the latter part of the summer, while horses are at grass, remains in the stomach through the

winter, until the end of the ensuing spring, when, being at the consummation of this stage or form of existence, it spontaneously disengages itself, and passes with the chymous matters into the intestinal canal; where its stay probably is but short, since it now lies loose among the alimentary matters, and is eventually cast out from its animal abode with the dung. Now, it has long been a question, and one which is not yet set at rest, on what these worms subsist in the stomach. Mr. C. supposes their food to be the chyme, which, (he says) being *nearly pure aliment*, affords probably but little excrementitious residue. I do not however believe that nearly pure aliment—what we understand by chyle, is found in the stomach, much less in the cuticular part of it, where, as far as I have observed, the food itself remains unchanged even into chyme. But, suppose they were surrounded by chymous, or even chylous matter, their mouths, instead of floating in it, are opposed to, if not in contact with, the lining membrane of the stomach, and consequently not conveniently placed for such imbibition: in fact, their mouths must be, I should imagine, enveloped and concealed by mucus, as abundance of that fluid is deposited upon the surface of the alimentary mass, to sheathe the stomach from mechanical irritation. For myself, I feel inclined to think that this mucus constitutes their food; and it is one probably that possesses little or no excrementitious matter, since it is itself re-absorbed in many parts of the body: but what favors this opinion is, that there are bots in the sinuses of the head, in the skin, &c. of cattle, which can have no other sustenance than the secretions of those parts, a fact that Mr. C. himself admits; and that worms in the intestines of animals are nourished in the same way, is rendered highly probable

by the existence of the ascaris in the colon and rectum—guts that contain little or nothing else but what is innutritious.

About the month of June or July it is, that the bots, having left the gastric region and been transported with the aliment through the windings of the intestinal tube, are discharged with the fæces; and at this period it is that people discover that their horses (particularly those that have been at grass the preceding autumn) have worms, to get rid of which vermifuges all at once come into general requisition, but if these well-meaning people will only have a little patience, these imaginary plagues will soon quit the bowels of their horses of their own accord. The larva, being ejected, lies not long exposed upon the ground, or concealed in dung, but quickly dries up and shrinks into the state of *chrysalis* or grub, in which torpid condition it continues for a few weeks, at the expiration of this time, "the superfluous moisture being removed, and the parts of the future insect being hardened by drying, it bursts from its confinement, and the fly appears making its exit at the small end."—"On quitting their shell" (male and female) says Mr. C. (from whom I am now citing) "they in a few hours become dry, take wing, and then seek their mates. The female being impregnated, searches for a proper subject among the horses, performs with great solicitude and care her office of depositing the eggs upon the legs of the horse, in the manner we have already stated, thus completing the wonderful round of its operations and history."

The insect of the ŒSTRUS HEMORRHOIDALIS or *fundament bot*, whose manner of depositing eggs, says Mr. C. has never been described, or known before, chooses the lips of the horse for this purpose, "which

is very distressing to the animal from the excessive titillation it occasions; for he immediately after rubs his mouth against the ground, his fore legs, or sometimes against a tree, with great emotion; till the animal at length finding this mode of defence insufficient, enraged he quits the spot, and endeavours to avoid it by galloping away to a distant part of the field; and if the fly still continues to follow and teaze him, his last resource is in the water, where the œstrus never is observed to pursue him. These flies appear sometimes to hide themselves in the grass, and as the horse stoops to graze they dart upon the mouth or lips, and are always observed to poise themselves during a few seconds in the air, while the egg is preparing on the extended point of the abdomen."— "The larva or grub of this species inhabits the stomach as the former, generally adhering to the white lining, and is disposed promiscuously in dense clusters after the same manner; they may however be distinguished from them *by being in general smaller, longer in proportion to their bulk and rounder; and I have thought, of a duller red, or more inclining to a white*, than those of the equi, for they differ in appearance in different subjects." These bots quit their habitation in the same season of the year, but are rendered remarkable by their "sticking more or less within the verge or opening of the anus, adhering to its soft lining, and producing considerable irritation. Indeed I once well remember," continues Mr. C., "being on a tour of pleasure in the Isle of Wight, and experiencing much annoyance from these larvæ. The little horse I had hired for the journey became so lazy and unwilling to go on, and moved so awkwardly, that I could not keep pace with my company, and I was at a loss how to proceed; but on casu-

ally taking up the tail, I discovered three or four of these insects hanging to the rectum, and their removal instantly proved a cure." Its change to the chrysalis state, and further transformation into that of insect, which happens in about two months, is similar to what befals the œstrus equi.

Of the ŒSTRUS VETERINUS, or *red bot*, so designated by Mr. C. in preference to retaining the epithet *nasalis*, which conveys a false notion of its habitation, the same historical detail does not appear to be made out, for this author commences his account of it by saying, "The mode of this insect depositing its eggs or nits, is at present unknown. By watching for them on the commons in the warm days of the sixth and seventh months (July and August) it might be detected, I apprehend, without very great difficulty. They perhaps deposit them about the lips or legs, as the former species. The larva of this species is also not certainly known. That it inhabits the stomach as the two former species there is little doubt; and I have taken considerable pains to search for it at the slaughter-houses, and have found a species in the stomach which widely differs from the equi and hemorrhoidalis, and which I presume may be the larva of this: though it is possible there may be a fourth species inhabiting the stomach of the horse, in which case it may be still doubtful, that I do not positively assert it to be this larva belonging to the veterinus."

"This larva, if it is the veterinus, may be known from the two preceding species, *being smaller, of a more tapering or oblong figure, and the segments more detached and rounded, shining, smooth, and of a pellucid red or ruby colour, more particularly at the tail or obtuse end.*"

After having described a fourth species, or what he apprehends to be so, from some peculiar characters it possesses, Mr. C. asserts that he once found the real chrysalis of the veterinus in the neighbourhood of Worcester, under some horse dung, a drawing of which he gives from memory.

The ovum, nit, or egg of the bot then, it appears, being deposited some time in the autumn upon the hair, gets licked by the tongue, by the heat and moisture of which it is instantly hatched, and its larva liberated and absorbed. With the food the larva is conveyed into the stomach, where it fixes its residence for the winter by insinuating its tentacula into the cuticular coat. In the spring of the year it withdraws its hooks, descends from the stomach into the intestines, and is carried along with the alimentary mass to be expelled with the fæces. Its exposure in the dung is quickly followed by its desiccation and contraction into the state of chrysalis, from which, in about two months, it undergoes its last metamorphosis into the insect called a gad-fly.

We now come to what our author calls the "PROBABLE EFFECTS OF THE GASTRIC OESTRI UPON ANIMALS," a subject replete with interest, and one that presents a wide field for speculation, both to the physiologist and natural historian. By a train of argument, interspersed with some (that appear to me to be) singular notions, Mr. C. endeavours to shew that bots exert a salubrious influence in the stomach of the horse by promoting digestion, acting as what he calls *vellicatories*, like local stimulants and detractors, on the principle of counter-irritation. I cannot however acquiesce in these hypotheses, much less admit what this learned writer has adduced in support of them. That "children of

cachetic habits breed worms faster than healthy children, which may tend to suppress or moderate the disease they incline to," is an opinion that obtained with our predecessors in physic, but one which I should apprehend would find few or no advocates among the physicians of the present age, and that sheep in low damp situations, *by being infested with worms, may be preserved from worse disease*, seems to me to be equally irreconcileable with the sound physiology of the day. What LINNÆUS taught, "that lice, by gnawing or irritating the skin of the head, excite a sort of running sores among boys kept in filthy work-houses, or confined places, and become strumous or swoln by the confinement, *by this excitement are preserved from coughs, wheezings, blindness, epilepsy, &c.*" might have been perfectly consistent with the pathology of his time, but that Mr. C. should repeat it to strengthen his opinions in this more enlightened age of medical science, I must say I feel some surprise. And when, in proceeding, I find it stated *that it will not be easy to discover how far the access of murrain in cattle, glanders, farcy, &c. in horses, may be prevented, and moon-blindness, inflammation of the lungs, spasms, splints, &c. in any degree checked or subdued by the presence of these local stimuli*— and in another place, *that his horse became fatter in consequence of having had administered to him about three dozen of bots' eggs, and that the nasal farcy gleets of horses were cured* BY STIMULATION TO THE STOMACH, *from the exhibition of two powerful astringents, cantharides and sulphate of zinc*, I must add that I depart *toto cœlo* from the views here taken of the effects, healthful or hurtful, of these little animals, and I venture to be the more explicit in my opinions of these *remarks*, as Mr. C. says he shall

not be tenacious about the permanency of the foundation they may furnish materials for.

But let us inquire how the operations are to be conducted to which Mr. C. attributes such a variety and number of beneficial effects—how bots *can* promote digestion, and excite irritation and issue by vellication. We must not forget that bots are attached to a part of the stomach that does not perform any proper digestive function, and that all stimulants or other substances promotive of digestion, must be applied to the vascular part, the only veritably digestive surface, or, it is obvious, they can have no such effect; moreover, the cuticular portion of the stomach being *inorganic*, how can any thing like a determination of blood or issue be produced in *it*? Indeed, I do not see with Mr. C. how they can perform the office of *stimuli* at all, unless it be that, by some motion they are capable of, they may have any such influence upon the mucous follicles placed in abundance under the cuticular coat; but then, again, we are not sure that this secretion is necessary to digestion! Thus far however, we perfectly coincide in opinion—"that the perfect health they (horses) enjoy with them, (bots) is proof sufficient of their innocuous nature and harmlessness in a general way *."

Mr. C. concludes his interesting account of the bots found in horses with some observations on the most effectual mode of destroying them. He observes, (and

* I have heard Professor Coleman say, that he knew of one case where bots appeared to have destroyed; for, after death, the coats of the stomach were found eroded in places, as well as the diaphragm, and some of these animals had made their way into the cavity of the chest.

this observation should be imprinted upon our mind that "At the natural annual period of their transformation they come away readily enough of themselves, and if it happens at the time that any medicine has been exhibited, it is considered as proof enough of its efficacy, and mistaken for the consequence of it—so easy is it to draw wrong conclusions. Neither opium nor tobacco given for several days have any effect upon them, as I have witnessed by opening the stomach after the death of such and finding them lively and well. We can, it is true, force the poison down the horse's throat, but we cannot afterwards get it into the throat of the worm, who is placed in his own element, and can refuse the food that does not suit him. Truly is it therefore difficult to destroy them by means of poison thrown into the stomach."—"The wisest measure," continues our author, "for securing animals from their effects is to prevent their propagation or access, and their habits expose to us an effectual mode of doing this. The eggs of the œstrus equi, which are very conspicuous on the knee, the mane, and the sides of the horse, may be washed off by a brush and warm water, or still more effectually removed by a pair of scissars. The same may be done for the hemorrhoidalis from the lips and beard."

"The other species being smaller, more rare, and probably less troublesome, require therefore less our consideration."

"In respect to the hemorrhoidalis also, where horses have been much out at grass the preceding year, they should occasionally in the warm months of the next summer be examined for them, when they will be found, as we have already stated, hanging to the extremity of

the rectum, and should be removed by the fingers. The destruction of a single one at this season of the year is not only the death of an individual and its effects, but the almost certain destruction of a numerous progeny; it is also useful in preventing the irritation which the spines of the bot occasion to the anus, which irritation becomes very distressing to the animal if he is used on the road, occasions him to move awkwardly, wriggle himself about, and to be sluggish, and though beaten severely he soon relapses again into his awkward manner of going; which as this happens generally in warm weather, is most commonly attributed to mere laziness."

It has been conjectured, that bots might prove serviceable to the animal by aiding the cuticular coat in the trituration of the food; but as I do not think that any proof or incontrovertible argument has been adduced in support of such a power being possessed by the stomach of the horse, and as I shall have occasion to discuss the question in another place, I do not conceive it necessary to reply to this conjecture here.

That Nature should have created an animal, and designed it as an inhabitant of the stomach of another animal, without some good, but, I suspect, unknown end, I think, in unison with others, highly improbable, and irreconcileable with other beautiful and more-readily-explained operations: I am however, for my own part, unable to draw up the curtain which is here interposed between fact and design.

Taking it for granted that bots in some way or other do good rather than hurt, surely we cannot be solicitous about removing them, for, though we cannot demonstrate their beneficial influence, we can, from all the cir-

cumstances we have a knowledge of regarding them, boldly assert, *that they are in no wise injurious*. Howbeit, we cannot persuade the world so, and therefore we must be prepared to meet the complaints of them who come to us about June or July, and say that "their horses have worms, which must be got rid of," with a remedy for that purpose. Should any other malady exist at the same time, no matter what, its origin will commonly be traced to the presence of these *mischievous vermin*. In all works on farriery, you will find some recipe extolled as a vermifuge; which, unless it contain a purgative ingredient, you may at once expunge as inefficacious, for we know of no medicine that has the power of destroying bots in the stomach, and if we did, are we sure that, even when dead, they would be detached from its cuticular coat: though, if they were in its vascular part, they would be subjected to the action of the gastric juice. No medicine therefore, not even a purge, can operate as a vermifuge but at a certain season of the year; when, as I said before, if you will but suspend its exhibition for a while, the worms will all readily pass away without your assistance. But, if we must prescribe something as a vermifuge, we have no other resource than a common purge: a dose of aloes is all that is required, though it is usual to combine it with calomel *, which will certainly render it more active, and herein resides all the (supposed) specific virtue of the latter medicine as a vermifuge.

* ℞ Ext. Aloes Vulg. ʒvj.
Hydr. Subm. ʒj.
Pulv. Zinzib. ʒß.
Syr. Simp. q. s. ut ft. Bol

The Lumbricus Teres.

The lumbricus teres or *long white worm*, is now and then found in the bowels of the horse after death; though it seldom or never happens, unless per chance one be voided, that we have any knowledge of its existence during life. This worm is white, round, sharp-pointed, and several inches in length, and in form resembles the common earth-worm. They inhabit the small intestines, mostly the jejunum and ileum, are but seldom seen in the large guts, unless medicine have been given, and never, I believe, have been detected in the stomach. They are more frequently found in the dog than in the horse. I have read strange accounts of the injuries sustained from the presence of these worms in the bowels, but so inconclusive are they, in consequence of the remedies employed having been of a more destructive tendency than the worms themselves, that I cannot determine what importance should be attached to them. I have not seen nor heard of any cases of this description, at the same time, I do not mean to assert that they never occur in practice, though I believe them to be exceeding rare. Apprehensions have been entertained by some of them *starving the horse to death*, by a consumption of chyle: we have no more reason, however, to believe that these worms feed on *chyle* than we have of the bots being nourished by *chyme;* on the contrary, I should argue, on nearly the same grounds, that their aliment might be the intestinal secretion.

I know of no symptoms on which we can rely that indicate the presence of these worms, emaciation, inordinate appetite, symptoms of pain in the belly, like those of gripes, unhealthy appearance of coat, a little exsiccated

mucus appearing about the verge of the anus, are stated to be signs of their existence; but I should advise him who values a correct opinion to withhold it until one or more of these worms shall have been discovered in the dung: and it commonly happens, that a solitary one of considerable length makes its appearance.

Should we detect any of them in the faeces, we may, with a view of expelling others, exhibit an aloetic purge, either with or without calomel, though I am not sure that this will have the desired effect: in the next case of this kind that presents itself, I purpose administering the oil of turpentine, in doses of four, six, or eight ounces.

The Ascaris.

The ascarides found in the bowels of the horse, are small, needle-like worms, in shape very like those of the same name that infest the human intestines, they are longer however, and are of a dark color, approaching to black. In the large guts, mostly in the cæcum, they are now and then discovered in prodigious numbers; to which the farrier does not fail confidently to assign the cause of the horse's death. Those however, who have carefully inspected such bowels after death, have, I believe, but in very few instances met with any erosion or injury that could be attributed to these worms. We can with little more certainty venture an opinion on their presence than we can on that of the lumbrici, unless we detect some of them in the dung, though, they may, and do sometimes, occasion so much irritation about the rectum, that the animal, from experiencing a troublesome *tenesmus*, ejects a little mucous secretion from time to time, which, adhering to the anus and

becoming exsiccated, is converted into a whitish powder.

Should any symptoms of pain or irritation make their appearance which there was reason to believe arose from the existence of worms, I would administer a full dose of aloes, or of aloes conjoined with calomel; or, if this failed to cause their expulsion in great numbers, I would have recourse to oil of turpentine in large doses, or in the form of enema, and follow up its exhibition, with either of the purges just mentioned. In general, about a week should elapse between the administration of each dose of the purgative medicine; for it will be necessary, in most cases, to repeat it once, if not twice.

The Tænia.

The tænia or tape worm has been seen in the intestines. One case only in which tæniæ were found after death, is recorded in the *Sick Journals* of the Royal Horse Infirmary. Professor Pratt makes this remark on it—"The tape worm is in fact so very rarely seen that but from the circumstance of the possibility of its being met with, it would scarcely deserve to be noticed as an enemy to the horse."

LECTURE XLVII.

On the Liver.

THE liver is the largest gland in the body, and performs the secretion of bile.

Having already (in Lecture the forty-second) described the situation and connexions of this viscus, it will not be necessary to repeat them here.

The figure of the liver varies somewhat in different animals: its divisions are better marked, and its edges thinner, in quadrupeds than in the human subject.

Its color is that of a reddish brown, this will vary, however, somewhat in hue, according to the quantity of blood the gland may contain.

In the human subject and in all quadrupeds, the liver is partially divided by clefts or fissures in its substance into *lobes*, of which there is great variety, as to number and shape, in the different *genera* of the latter: in the horse it is composed of two principal divisions or lobes, united in the middle by the *portio media* or intervening portion, and of two *lobuli* or small lobes. The right or large lobe is placed entirely in the right hypochondrium. Along its concave part, from its obtuse border, proceeds the *lobulus caudatus*, a triangu-

lar portion of liver included within the fold of the ligamentum latum dextrum. The other lobulus, having a circular border with several clefts or fissures through it, whence it may be denominated the *lobulus scissatus*, springs from the anterior and under part of the portio media. The left lobe, nearly equal in size to the right, has the general outline of an oval; indeed this figure would be perfect were it not interrupted by the union of the lobe with the portio media.

Every part of the liver, with the exception of the spaces occupied by the coronary ligament and posterior vena cava, is so closely invested by peritoneum that the membrane has the appearance of being a distinct capsule; but, though some have described a covering underneath, as separable from it, which they have named the *tunica cellulosa hepatis*, anatomists in general do not admit of any such or proper tunic.

The liver, like other true glands, is composed of arteries, veins, excretory ducts, nerves and absorbents, united together by a particular tissue, to express which we have the term, *parenchyma*. Its arteries, named from the trunk from which they spring, the *hepatic*, a branch of the abdominal aorta, are but of small size in proportion to its bulk, and in comparison with others which supply the viscera in the vicinity: *e. g.* if we contrast the splenic arteries with the spleen, or the emulgent with the kidney, and then compare them with the hepatic, and contrast the hepatic with the liver, we shall find that the latter are remarkably disproportionately small.

In the venous system of the liver, we discover a peculiarity, of which no parallel instance is to be found in the animal economy; not only is it furnished with

veins that perform the office of returning blood, but it has others for the purpose of conveying blood to it, which are to be regarded in the light of secerning *arteries*. The trunk they spring from is called the *vena portarum*, a vessel formed out of the union of the splenic and mesenteric veins, which takes place immediately above the pancreas. This vein crosses over the duodenum, to the right of the hepatic artery and duct, and proceeds to the concave part of the liver, about opposite to the middle of the right lobe, it bifurcates, the right division directly enters the gland, the left continues its course forward, in company with the hepatic artery, and sub-divides into two others, which penetrate the portio media and left lobe of the organ. Then branches spread out in an arborescent manner within the substance of the liver, ramify to great minuteness, and at length radiate into a system of capillary tubes, which, from some peculiarities they exhibit in their arrangement, have been named *penicilli*.

The *hepatic veins*, the vessels that return the blood conveyed hither by the vena portarum and hepatic artery, are in the horse small but exceeding numerous: their orifices may be seen, appearing like so many pinholes, by slitting open the posterior vena cava.

The *hepatic duct*, remarkable for the whiteness of its coats, will be found running along the upper and inner edge of the right lobe, and receiving in its course many small ductiform tubes from the interior of the gland; its trunk afterwards accompanies the hepatic artery, to the right of which, and below the vena portarum, it continues its passage to the duodenum. This duct is a muscular tube, having a membranous lining, large enough to admit of the introduction of the little finger.

and about three inches in length. It pierces the coats of the duodenum, about six inches from the stomach, in conjunction with the pancreatic duct, and opens by an orifice distinct from the one of that duct; though the terminations of both are guarded by one circular flap, composed of doublings of the inner and muscular coats of the gut, which performs a valvular function in preventing the entrance of alimentary matters into these tubes.

The nerves of the liver, neither large nor numerous, for it does not appear to possess much sensibility either in health or disease, come principally from the sympathetic; it receives also a few filaments from the par vagum. Its lymphatic vessels, on the other hand, are extremely plentiful and are readily demonstrated: we have nothing more to do than to insert a small injecting pipe under its peritoneal capsule, and allow quicksilver to diffuse itself, and we shall instantly fill very many of them, making a beautiful, vascular, arborescent display upon the surface.

The hepatic artery having entered the substance of the organ, disperses its ramifications through every part, which terminate not only in nutrient extremities, but in vessels of communication with all the others, at least, if fine injection be thrown in, it will not only pass into the hepatic veins, but also find its way into the branches of the vena portarum, and those of the hepatic duct; in fact, the researches of anatomy appear to prove, that there is free intercommunication between these different sets of vessels, for if either of the others be injected (except the hepatic veins which have valves) the same result is afforded. If a piece be torn or broken

off the liver, we shall perceive upon the lacerated surfaces numerous little granulary eminences, to which anatomists have given the name of *acini*. these small bodies, which are united together by a fine cellular web, are composed of the ramifications of some or all of the vessels I have enumerated, but what their intimate structure is, or how or in what manner they are constituted, remains yet to be explained. Again, if we closely inspect the surface of a clean cut into its substance, we shall perceive numerous minute pores, from which a yellowish fluid may be expressed. these are the *pori biliarii* the radicles of the hepatic duct, which run in company with the arterial and venous ramifications, repeatedly unite and re-unite until, at length, they all end in a single tube. Now, to sum up the functions of these several parts, as far as the most rational inferences and suppositions will warrant, it is believed, that the separation of bile from the blood takes place within the acini, that the pericilli are the secerning vessels, and that the secreted fluid is received by the pori biliarii, and by them conducted into the hepatic duct. It has long been, and still is, an undetermined point in physiology, whether the secretion of bile is performed by the vena portarum alone, or whether the hepatic artery assists in that operation. It has been said, on one side, that bile could only be produced from *venous* blood, and consequently that the blood of the hepatic artery must be wholly consumed in the nourishment of the organ, two cases however that have occurred in the human subject, where the vena portarum was wanting, (the vein corresponding to it terminating in the vena cava inferior,) the hepatic

artery unusually large, and the hepatic veins were ending in the vena cava, have refuted this opinion*. An argument in favor of some bile, under ordinary circumstances, being secreted from arterial blood, is the communication which the hepatic artery can be proved to have with the vena portarum and the hepatic duct; when we look, however, at the volume of this gland, and contrast it with the size of the hepatic artery, or even compare the latter with the hepatic duct, we shall be convinced that, if it do secrete at all, it can be but to a very trifling amount, after it has expended blood enough for the nourishment of the organ. On the whole, we may probably regard the hepatic artery in relation to the liver in the same light as we do the bronchial to the lung, and consider the system of the vena portarum as the proper biliary apparatus.

The Gall Bladder, an appendage to the liver possessed by man and most other animals, is merely a receptacle for bile, in which that fluid becomes concentrated by absorption of its watery parts, and, at such times as it is required, passes in that state into another duct leading to the duodenum, which also has a communication with the hepatic, to mix with the chymous mass: this viscus, although one of much utility, does not appear to be indispensably necessary to the well-being of the animal, as no ill consequences have resulted from its removal. The horse and some other quadrupeds have no gall bladder, consequently the bile flows along the duct, as fast as it is secreted, into the duodenum: why these animals are not furnished with

* One is detailed by Mr. Abernethy in vol. lxxxii of the Philosophical Transactions, the other by Mr Lawrence in vol. iv of the Medico-Chirurgical Transactions.

such an appendage. I shall endeavour to show in the lectures on digestion.

The principal use of the liver probably is to secrete *bile*; I say the *principal*, for there would appear to be some other, yet but imperfectly made out: an opinion broached long ago by those writers who considered the small quantity of bile produced as inadequate to employ altogether a viscus of such magnitude, and one that has received much support from later anatomical and physiological researches. If the hepatic duct be tied, or the gland be so diseased that the secretion cannot go on, the animal, it is said, not only becomes constipated in its bowels, but suffers much from disordered general health: hence it has been conjectured, that something noxious to the animal economy is therein eliminated from the blood, and discharged with the bile into the alimentary canal.

The very conclusive experiments of Mr. Brodie leave us no room to doubt "that the office of the bile is to change the nutritious part of the chyme into chyle, and to separate from it the excrementitious matter *." It has been imagined also by some, to stimulate in its passage the internal surface of the intestines, and thereby produce a more ready expulsion of the excrement, which owes its yellow color to the presence of this fluid.

On the Diseases of the Liver.

In horses, hepatitis (inflammation of the liver) is by no means of frequent occurrence, a fact much more satisfactorily accounted for, in my opinion, by referring it to an absence of those causes which generally induce

* Vide No. xxvii. of the Journal of Arts and Science.

hepatic disease in the human subject, than by any inferences we may draw from its singleness or simplicity of duct; though, in offering this explanation, I wish the axiom to be kept in view, that the more complicated any organ is in its construction, the more liable it is to be out of repair. Intemperance in eating and drinking, passions of the mind, and sedentary habits, to which the majority of these complaints may be referred in the human subject, cannot be assigned as causes of disease in horses; adequate reasons, I think, to account for the comparative rarity of such cases: continued exposure to heat also produces them in us, so that in hot climates or during hot seasons, hepatitis is very prevalent: whether climate or exposure has any such effect in the horse, I am unprepared to offer an opinion. It has been remarked by those who have extended their pathological observations to cattle, that such as are stall-fed, as oxen, &c. not unfrequently shew signs of diseased liver; and that, in such animals, after death, there is an unusual yellowness of the fat: under these circumstances, the exciting causes appear to be a highly nutritive diet, combined with want of exercise. In the horse, however, not only are these cases seldom seen, but they are occasionally, when present, mistaken for others of a different nature, or altogether disregarded as unimportant objects of practice; and I trust that most veterinary practitioners will bear me out in this remark, when I allege, as a reason, that, in truth, diseases of this organ are far from being well marked. Even in the human subject, a patient who can express the seat and kind of pain felt, and in whom we may sometimes detect morbid action in the viscus by

pressure, cases occur in which it is extremely difficult to distinguish it from inflammation within the chest; how much oftener then must it be obscure in the horse, who can furnish us with no such signs to direct us in our diagnosis.

Dissections prove to us, that this disease has not always precisely the same seat: in some cases the inflammation is confined to the peritoneal tunic; in others, the substance of the organ only is affected. The first will probably give rise to a set of symptoms so much resembling pneumonia, that I doubt much whether any one could positively say to which they belonged; of the last, however, we may and do have now and then, unequivocal evidence. What contributes still more to confound these cases, is, that hepatitis is an occasional concomitant of thoracic inflammation, so that the horse will shew a yellowness about the eyes at a time that the symptoms manifest pneumonic disease, and to this circumstance probably we may ascribe the alleged frequency of what is called *yellows*, by many writers of works on farriery. Without drawing any analogical deductions, from human to veterinary pathology, and without even adverting to the sensibility of the organ in a healthy condition, I may state, from my own observation, that the horse expresses but little pain who labors under inflammation of the liver itself, and more especially if that inflammation be of a chronic kind, he may be inactive, moping, and dull, off his appetite, and appear to suffer much inwardly, but he will exhibit none of those signs of acute pain which accompany inflammatory affections of the stomach or intestines: at the same time, chronic affections of the other viscera may render

him alike spiritless and stupid, so that in fact we can collect little or nothing certain from such symptoms *. Our chief dependance must be on the state of the bowels, on the nature of the evacuations, and on the appearance of bile in the system. Costiveness *may* be present, or the intestinal discharges may be sparing, (*buttony,*) and not of their ordinary color, from being deficient or altogether void of biliary fluid, though I believe this to be very uncommon; on the other hand, it *may* happen that purging is a symptom, from a redundancy of bile. Again, jaundice may originate in hepatitis, which the yellow tinge of the tunica conjunctiva of the eye, and the skin about the mouth and nose, together with the high color of the urine, will manifestly denote the presence of; this however is only likely to happen under certain circumstances, as from compression of the ducts by tumefaction of the substance of the organ, so that the passage of bile through them is prevented, or in consequence of the inflammation extending to the duct itself, whereby its coats become thickened and its canal contracted. Another symptom, that has been casually noticed, is, that the horse is lame, a hint we have imported from human practice, but we must be cautious how we give this symptom currency, for, though it is true that

* Of the truth of this remark we had about a twelvemonth ago two unfortunate instances. One was a horse of high value that exhibited all the general symptoms of extreme ill health, without directing our attention by any thing we could detect, to any particular part. he evidently grew worse every day, and though we were inclined to refer his disease to the liver, we were by no means confident in our opinion. In the course of ten days, death took place, and dissection shewed the most destructive ravages of disease in this viscus.

men, having hepatitis, now and then complain of pain about the top of the shoulder, the opinion of physicians in general is, that it is a symptom that is frequently wanting, and that its absence is by no means a proof that disease is not going on in the liver. I have never met with a single instance of it myself, and have only one authenticated case to adduce here, which is one that is usually related by Professor COLEMAN in his lectures. The horse belonged to the Royal Artillery, at Woolwich, and was lame in the off fore leg, by which eventually he became so disabled that he could scarcely project the limb in attempting to walk: no local cause being apparent, and the lameness in spite of remedy continuing, the animal was at length destroyed. On dissection of the limb, every part of it was found free from disease; but, on examination of the viscera, a thorn of great length was discovered sticking in the substance of the liver. These then are what may be considered as the diagnostic symptoms of hepatitis; I have endeavoured to shew how much reliance is to be placed in any one of them, and in all of them collectively: of course, they will generally be attended with the common febrile disturbance—though I have never witnessed much derangement in the respiration, and, as I said before, accompanied with dejection and more or less stupor, and by the intensity of these symptoms and a due consideration of all the circumstances of the case, we must, it called on, frame our prognosis.

It is difficult to say what the causes of hepatitis are in the horse. External injury, such as a kick or a blow on the right side, *might* give rise to it, or, as we have seen above, a wound of the organ: perhaps it sometimes originates in fulness of condition and in the irregularity

with which many horses are worked or exercised, or in the total want of exercise.

This disease, like other acute inflammations, may terminate in resolution. Should its peritoneal covering only be affected, an opacity and thickening of it, or some adhesion of it to the contiguous parts, will probably ensue: I have in two or three cases found it firmly glued, in this manner, to the diaphragm *. A common termination of it in the human subject is in suppuration, or abscess; and this happens when inflammation has attacked the substance of the gland, and has been protracted: my father has a recollection of two or three such cases; but, unfortunately, no minutes were made of them. I am disposed to think that this disease oftener assumes the chronic than the acute form; for I have heard of and seen many instances in which the liver exhibited morbid appearances after death, though the horse appeared to have enjoyed perfect health during life. The most common alteration of its natural structure seen in these cases, is what is called *schirrus*; a disease that is supposed to originate in the effusion of adhesive matter into the parenchymatous substance, whereby that is rendered more compact, is solidified and indurated. Tubercles also are now and then met with: those that I have dissected have been of a greyish color, and yellowish white.

The disease being made out, the treatment is readily determined on. Bleeding, purging, and counter-irritation comprehend the efficacious means, all others I

* Some few years back, a horse, whose malady was not made out by the practitioner in attendance, died purely from this disease: at least, inflammation of the liver, and adhesion of it to the diaphragm, were the only morbid appearances I could find after death.

know of, I regard as empirical or valueless. Should it be an acute case, take away from four to six quarts of blood, but if it has the chronic type, I generally draw two or three, and repeat the operation every second, third, or fourth day. Purgatives are peculiarly adapted to these cases, either acute or chronic, in consequence of their giving rise to the consumption of much of that blood which must otherwise be returned to the vena portarum and distend the vessels of the liver; and, for this reason, it is important that we do not mistake it for pneumonia, and *vice versâ*. Give a dose of aloes alone*—no other purgative will answer the purpose so well, and repeat it in the course of forty-eight hours, should its operation have ceased, or in half that interval, should it have not operated at all; and do this until some impression shall have been made on the disease. Mercurial purges are injurious—they are direct stimulants to a gland already disturbed and irritated by inflammatory action. Blisters should be applied as soon as the animal has been purged: rub from three to four ounces of the infus. lyttæ over the region of the liver, and repeat the application as often as is necessary to keep up a serous issue. In chronic cases, blisters are also very useful; or setons may be introduced in the side.

Jaundice.

Rather an unfrequent disease among horses is jaundice. And one reason appears self-evident as soon as we are put in possession of a knowledge of the causes from which it may proceed. I mentioned swelling or compression of the hepatic duct as one, in speak-

* ℞ Aloes Vulg. Ext. 3x.
Syrup. Zingib. q. s. ut ft. Bol. Statim dandus.

ing of it as a symptom of hepatitis, and probably this is the most common one. In the human subject, it frequently arises from obstruction of the ducts, either from collected or concreted bile in them, to which the name of *biliary calculi* is given; or it may be the effect of spasm in the ducts, or in that part of the duodenum where they terminate: but I am not aware that cases of this kind have occurred in veterinary practice. And one reason, I repeat, is obvious. The horse has but a single duct, through which the bile flows as fast as it is secreted; it has no retrogade course to take, no receptacle to collect in and to concrete into gall-stones: and, as a proof that this is one reason, dogs and such other of our domestic quadrupeds as have gall bladders, are all of them much oftener jaundiced than horses. People who lead sedentary lives, such as corpulent subjects and women, are predisposed to jaundice; in them, the bile often grows inspissated in its ducts, and biliary calculi are now and then detected in the stools: this is a cause of disorder, as I have said before, that we can but rarely adduce in veterinary practice.

Jaundice, produced from whatever cause it may be, consists in the absorption of unchanged bile into the circulation, which bile becomes diffused and conveyed to every part, giving rise to those appearances that are so remarkably characteristic of its presence. It does not appear to originate either in defective or altered secretion; for, had the liver not performed its office, how could we explain the appearance of bile in the system at all?

The yellow aspect that jaundice gives to the skin, the mouth, and the eyes, at once betrays its presence. The skin is everywhere dyed yellow, though the change is only visible to us in places bare of hair. The mem-

brane of the mouth puts on the same appearance. The conjunctiva (the membrane lining the eye-lids) has a yellowish pink hue, the cornea is obscured, a yellow sediment may often be perceived floating in the anterior chamber, and the iris itself is tinged in places with this yellow dye. The bowels are costive: the excrement that is voided is hard, *buttony*, and dark-colored, besmeared often with a yellow slimy matter, like bile diffused in mucus, and consists of dryish masses of ill-digested aliment. The urine is a deep yellow or orange color, and is sparing in quantity. In the human subject, the absorption of bile into the system often generates considerable disorder, operates in fact like so much poisonous matter, exciting an itching sensation of the skin, and depressing the strength and spirits of the patient; and the latter of these effects is often very remarkable in jaundiced horses. The eyelids are drooping or closed, the head hangs down, there is evident sinking both of strength and spirits, and often there is a degree of moping stupor present, which at times borders on vertigo, so that the animal walks unsteadily or reels as he moves; his pulse is about 60° or 65°; his respiration is unaffected, and his flank untucked up.

In the treatment of jaundice our sheet-anchor is purging. No time should be lost in exhibiting ten or twelve drams of aloes; and, if we can insure the administration of it, the decoction is preferable to a bolus. If there was much stupor or vertigo present, I would bleed, but not largely. I would follow up the first dose of aloes with half-an-ounce in solution every twelve hours until purgation came on: we need be under no apprehensions of super-purgation in these cases. As soon as the bowels are freely opened, apply a blister to the right

side, and repeat it every twelve hours. It may be necessary to recur to the venesection.

Now and then jaundice terminates fatally, and when it does so, the event is commonly sudden: probably some time has elapsed before we are called in, the bowels resist our first dose of medicine, in the mean time the pulse rises in spite of our recurrence to the use of the lancet, the skin and extreme parts become cold, the animal grows senseless and perhaps vertiginous, and in that state suddenly drops and expires. On dissection, the liver is found glutted with bile. I found the gland so prodigiously distended in one case that the right lobe of it had burst, and displayed a considerable fissure.

Now and then we hear of cases of rupture of the liver. I have never been present, but at the one mentioned above, myself; but I am told that large, heavy, draft horses are more particularly liable to the accident; and that it happens in the violent efforts they are compelled to make in drawing heavy loads.

LECTURE XLVIII.

On the Spleen.

THE spleen is an organ of an extended pyramidal figure, lying between the stomach and false ribs, in the left hypochondrium.

This viscus owes its color principally to the blood with which it is glutted after death. Prior to exposure to the air, which reddens it, it is of a blue mottled or marble hue; it is much darker however, and resembles the color of venous blood when cut into.

Though its size varies somewhat in different horses, in a healthy condition, it seldom or never exceeds three pounds in weight.

The spleen is adapted in shape to the space it occupies, being concave next the stomach, and convex where it is opposed to the ribs, it differs altogether remarkably in figure from that of the human subject, for it is broad and thick at one end, and lengthened out nearly to a point at the other.

It receives a complete covering from the peritoneum, to which it owes its apparent solidity and firmness of substance; for, when stripped of this tunic, its texture is found to be soft, lacerable, and spongy, and to present

internally all the appearances of a gland; and as such any one would not fail to regard it who had not made himself acquainted with its intimate structure. It differs remarkably however from a gland, in not having any excretory duct: an appendage for which it has no occasion, as it is not believed to perform any secretory function. It is now generally supposed, that the arteries of the spleen, after having branched out within its substance into innumerable ramifications, terminate in cells, of a membranous composition, from which veins, about equal in number, take their origin. To elucidate this structure, it has been likened to a piece of sponge, or a honey-comb; to which, if blood-vessels were superadded, probably the general composition of it bears some resemblance. By regarding it as a spongy or porous body, we can account very satisfactorily for the extreme variableness in the volume and weight of this organ; for it is obvious that it will admit of great latitude in its state of distention, and that its weight and volume must greatly depend upon the quantity of blood it may contain. It also possesses nerves, though they are but small, as well as absorbents, which vessels are very numerous, and readily demonstrable by injecting quicksilver under its peritoneal tunic.

This viscus receives its blood from the splenic artery, a large branch of the posterior aorta, which, in running along the great curvature of the stomach, detaches numerous short ramifications both to it and to the spleen. The splenic veins, much larger than the arteries, unite with those of the stomach, and form a vessel that largely contributes to the production of the vena portarum. Its nerves come from the cœliac plexus.

The magnitude and organization of the spleen in the higher order of animals, together with the constancy of its presence, are of themselves forcible arguments to establish its importance in the animal constitution; it would appear however, from some facts, not to be equally useful with other abdominal viscera; for, if it be carefully extirpated, the animal will not only survive, but thrive and do well: indeed, in the human subject, it has been found after death so disorganized from disease as to have been apparently incapable of performing its function during life; and one case is related in which it was cut out without the individual experiencing any great inconvenience from its loss.

From the general resemblance in composition between this organ and those that are known to be glandular, very diligent search has been made after an excretory duct; no vessel of the kind, however, has ever been demonstrated, though more than once have anatomists been led away with the idea that they had discovered traces of one. Seeing, then, that the spleen was without a duct, (and, as I observed before, there is no want of one, there being no secretion carried on,) physiologists, compelled to relinquish the notion of its being a gland, have attempted to explain its use from what appears to be a faithful description of its structure, connections, and relative situation.

It would be an idle and a fruitless task for me to collect and expound here the many theories that have engaged attention from time to time on the physiology of this organ: rather let me cursorily examine those which are at the present day considered, if not as more conclusive, at least more feasible than any that have preceded them.

Some are of opinion that the function of the spleen is connected with the economy of the liver. That, by retarding the circulation and otherwise altering the nature of the blood, it renders that fluid *peculiarly* fit for the secretion of the bile. Although splenic blood, however, appears to have had its properties somewhat altered from that which is found in other viscera, inasmuch as it is seldom or never seen coagulated, and, as has been proved by Sir EVERARD HOME, as it contains a greater proportion of serum, still we have no decisive evidence that these changes are wrought in it by the spleen, nor have we any just reasons to believe that they are essential to the secretion of bile; for, as I mentioned in a former lecture, cases have occurred in the human subject in which the vena portarum terminated in the vena cava, and in which the bile consequently must have been produced from arterial blood alone.

In the face of these objections, others, without any allusion to the *specific* properties of splenic blood, have attributed to the spleen simply the office of altering its character from arterial to venous, by conducting it through small and tortuous canals, and detaining the fluid for a certain time within its cells. The advantages of this, say they, are evident. The supply of venous blood from the other chylo-poietic viscera being insufficient for the purposes of the liver, the splenic blood makes up the complement; had such a provision not been made, a vessel, probably equal in size to the vena portarum itself, must have been superadded to the arterial system, and this would have demanded a considerable augmentation in the aggregate quantity of blood. The blood returned by the veins of the spleen is certainly much darker than that which flows in its arteries;

and its structure (so far as we are acquainted with it) will tend to produce this change by retarding the circulation; but, independently of the fact that bile can be obtained from arterial blood, it appears to me to be incongruous with other beautiful and harmonious operations, to suppose that an organ should be constructed of magnitude and complication like the spleen, purely for the purpose of undoing what has but now required the elaboration of the lungs to effect.

Another, and probably the most ingenious of the modern theories, is that of Dr. Haighton's. This gentleman thought, that the spleen acted as a *diverticulum* to the blood, and thus proved subordinate in function to the stomach. That, when the stomach is distended, the spleen being compressed between it and the ribs, the splenic artery cannot receive so much blood, and consequently it must flow in abundance into the gastric arteries, which require more at this time for the supply of gastric secretion; on the other hand, when the stomach is empty, the spleen again expands, and admits of a considerable influx of blood. It has been argued against this theory, that pressure and counterpressure being equal, if the stomach obstructs the passage of blood into the spleen, the contrary to this must happen. And so it would if these bodies were placed under similar circumstances; but, as the splenic arteries *all* run between the stomach and the spleen, and many of the gastric are entirely removed from such compression, and as the one organ is so much smaller than the other, it is evident that the pressure and counterpressure, though equal in force, are very unequal in regard to their effects. But, although this argument is not valid, there are some facts that tend not a little to shake

this opinion, and of these probably the strongest arise from a survey of these organs in the horse: it appears to be however the least objectionable theory we have, and is for certain one that has not been adopted without the concurrence of many nice and difficult experiments.

On the Diseases of the Spleen.

This is an organ but little subject to disease in horses; and when it is diseased, I know of no symptoms especially arising therefrom.

In two or three instances, I have found it very much enlarged, though not, to appearance, in the least altered in texture: in one of them, it weighed fourteen pounds, two ounces—eleven pounds more than its ordinary weight. This is by no means a very rare occurrence in the human subject; and more particularly in people that have experienced repeated attacks of intermittent fever; in whom the enlarged spleen is called the *ague cake*: how, or why this takes place, however, is not at all known. Should we, from any circumstance whatever, be induced to believe that this organ was in a state of disease, we are to treat the case by the same rules and remedies as we would one of diseased liver.

In the year 1812, I was called to rather a singular case—a rupture of the spleen. A horse that was at strawyard, was seen about seven *p. m.* manifesting symptoms of gripes; he was accordingly taken into the stable, and made to swallow in a drench two ounces of oil of turpentine. As he appeared to be relieved, nothing further was done that evening. The next morning, he had a relapse of the same symptoms in a more violent degree, of which he died about ten *a. m.* Shortly afterwards he was opened; and the first appear-

ance that attracted notice was, that the guts were stained here and there with blood; and they were no sooner removed than from ten to twelve quarts of that fluid, partly congealed, were found effused into the belly. At first, I suspected this hemorrhage to have been caused by the bursting of some important blood-vessel; but further examination shewed the spleen to have been ruptured to the extent of about four inches, along its convex border, where it is opposed to the false ribs. While I was inspecting this wound in the spleen, which was now filled with a coagulum, I was amazed at the prodigious distention of the stomach with air—indeed, it occupied so much of the surrounding space that I felt inclined to believe that it might, by compression, have been the cause of the rent in this viscus, which probably happened during some violent effort in respiration; for I could find no mark whatever of any external injury upon the side, either inwardly or outwardly.

Mr. Henderson has a specimen of ossification of the spleen. An abscess, about the size of an apple, whose parietes are bony, had formed in it next the stomach, about midway between its base and apex, from which was liberated, after death, a coffee-colored purulent fluid. It was taken from a horse much wasted in condition, that was killed at the slaughter-house.

On the Pancreas.

The pancreas, in common language the sweetbread, is a glandular organ, situated across the spine in the epigastric region, that prepares a fluid supposed to be of use in perfecting the digestive process *.

* For the connections and relative situation of this viscus, *vide* Lect. xlii.

It has no peritoneal covering—the membrane simply passes over it.

The pancreas has been divided into *head*, *body*, and *tail*; it has also a fourth part, attached to the right side of the spine, a prolongation from its head, to which the name of *pancreas minor* has been given.

Anatomists all agree, that there exists a similarity of structure between this organ and the salivary glands; and what tends to confirm this opinion, is, the resemblance that the pancreatic fluid bears to common saliva. The pancreas is of a pale red or speckled color, and is composed of many small lobes or lobules, which, though they intimately adhere together by a fine cellular tissue, are perfectly distinct from one another in regard to their ultimate organization. For every one of these lobules, or (as some call them) *acini*, appears to be constituted of a set of arteries, veins, and ducts, which vessels have no communication, except through the medium of their trunks, with those of any other; so that a certain quantity of secretion is prepared within, and discharged from, every one of them: in fact, every lobule may be said to be a distinct gland of itself, and this is the case in respect to the salivary glands. In the dissection of an injected pancreas, we may trace many arterial twigs into these acini, which are detached at right angles from the principal pancreatic artery as it pervades the interior of the gland; the veins also may be seen accompanying the arteries. The duct, which consists of two main branches, has a similar mode of ramification. Having been formed at the extreme end of the gland by the union of several smaller tubes, it takes its course through the middle of the viscus, receiving in its way other little ductiform vessels which

come from the neighbouring lobules and contribute to augment its size. Thus formed, the long branch issues from the body of the gland, the short and larger one from the head, and pancreas minor; the two then unite into one trunk, about an inch in length, which runs directly from the spleen to the duodenum, and pierces the latter alongside of the hepatic duct. It is composed of a thin, pellucid membrane of considerable strength, and is large enough in its calibre to admit of the introduction of the finger.

The pancreatic arteries are derived mostly from the hepatic; many however come from the splenic, in its course to the left side of the abdomen, and one or two from the gastric. The veins are tributary to the vena portarum. The small nerves discovered in it, are furnished by the cœliac plexus.

Nothing precise appears to be known about the use of the pancreatic juice; though, in its nature, it is generally allowed to resemble saliva. The duct has been tied, and the gland removed altogether, in dogs, without any apparent disturbance of the animal's health. The quantity secreted is believed to be considerable; at least, so it would appear from many experiments that have been made to collect it; but, like the separation of bile, it is probably greatest during digestion: indeed, if we might be permitted to reason from its resemblance in structure and secretion to the salivary glands, we should say that it was only at such times that the pancreatic juice flowed at all. We may attribute to this fluid, perhaps, the attenuation of the chymous mass; and, from its entering the duodenum at the same time (and sometimes through the same orifice) as the bile, it may

also dilute that secretion, and serve to diffuse it more uniformly through, or incorporate it with, the alimentary mass.

In the course of the *post mortem* examinations at this establishment, which have neither been few nor unproductive, no morbid appearance of the pancreas has been recorded or noticed. In the ox, I have heard of calculi having been found in it.

LECTURE XLIX.

On Digestion.

IN my lecture on the stomach, I observed, that animals alone were provided with digestive organs; and that this was so universally the case that even the lowest orders presented something of the kind in their constitution; and that this important fact had prompted physiologists to designate the stomach as the chief characteristic between animal and vegetable existence. It is by means of a digestive apparatus that the food undergoes those changes which, in the end, assimilate it to the nature of the component parts of that animal whose nourishment and growth it is destined to support. In order to take a comprehensive view of the process of digestion, I shall commence with the mastication of the food, and its transmission through the pharynx and esophagus into the stomach; secondly, I shall examine what changes it undergoes in that organ; and thirdly, I shall inquire in what way the alimentary mass, after it has entered the intestinal canal, is converted into nutritive and excrementitious parts, and how these parts are separated from each other.

By the natural historian, the horse must be regarded,

in every point of view, as a graminivorous animal; his natural habits of living are such that he loathes, even to abhorrence, any kind of animal food; it will therefore be unnecessary for me to dilate on this part of my subject. But we have other (we may call them anatomical) proofs of his being so; for, by the rules laid down for the classification of animals according to the food upon which they are known to live, we can satisfactorily demonstrate that the horse differs essentially in his internal conformation from those animals that feed upon flesh, denominated carnivorous. In the latter, which are characterized by a savage and voracious disposition, as animals of prey, the teeth are found to be sharp and pointed, calculated for tearing the flesh or breaking the bones of other animals; the stomach has no blind pouch, nor cuticular coat, but readily admits of the passage of the aliment into the intestines; and the intestinal canal is short, and, generally speaking, presents but few or no obstacles in its construction to the progress of the alimentary mass—which not only contains more nutriment in less bulk, but is more easily digested and assimilated. But in graminivorous animals, the teeth are formed either to cut or bruise substances of a vegetable nature, and, from the disposition of the molares and action of the jaws, to grind them in a somewhat similar manner to the operation of a mill; the stomach or intestines, or both, are capacious, and so constructed as to retard the passage of the alimentary mass—in consequence of its requiring longer time than animal food to undergo the necessary changes. Man, who resembles in some of these peculiarities both the carnivorous and gaminivorous animal, has by some naturalists been ranked with the former;

while others have maintained that the fruits of the earth, and not the flesh of animals, was his natural food: it appears, however, that enough may be advanced on both sides to prove that he can either be carnivorous or graminivorous, according to the circumstances under which he is placed; or rather, that he is both, and may be specified as omnivorous.

Mastication and Deglutition.

By mastication, or manducation, vulgarly called chewing, is meant that operation of the jaws and teeth by which the food is divided or bruised, and reduced to such a state as to be easily swallowed. Man and some animals are provided with hands or paws for the purpose of taking food; the horse and hosts of others are only enabled to do so by means of a remarkable prolongation of the jaws, and the combined operations of the lips and teeth. The lips of a quadruped grazing, are separated, and often everted, so as to embrace the herb, which passing between the jaws, at the time partly opened, is seized by the incisores, and, by a sudden acclination of the head, nipped off and committed to the tongue; but, in taking food which is already separated or divided, the nippers have little else to do than to assist the lips in gathering it into the mouth in suitable quantities. By the actions of the tongue, and coadjuvancy of the muscular sides of the mouth, the abscised portions of aliment are speedily carried upward and distributed over the lateral parts of the cavity, to be subjected to the operation of the grinding teeth. By these teeth the food, according to its nature, is bruised, broken down, or comminuted, and at the same time mingled with saliva, which is now discharged upon

it in abundance from the ducts of the various salivary glands. These operations are necessary to prepare the food for the imbibition and action of the juices of the stomach, and especially the preparative of mastication; for, as we shall hereafter discover, there are certain sorts of provender which, unless they are broken or crushed in the mouth, are not triturable or digestible by any operation in the alimentary canal. Those portions of aliment that have undergone sufficient mastication, and softening by commixture with saliva, to render their passage into the stomach unirritating and facile, are collected together into a mass or bolus of moderate size upon the dorsum of the tongue, which is made hollow to receive them; whence, by the action of that organ, aided by the co-operation of the muscles of the cheeks and fauces, the bolus is propelled upward and backward into the pharynx: the jaws being shut and fixed at the moment, the tongue pressed against the palate, the sides of the mouth compressed to prevent its return, and the velum palati, which the bolus itself has forced upward, obstructing its passage into the nose. The pharynx having received the bolus, by the actions of the constrictores transmits it into the esophagus, by the successive contractions of the transverse muscular fasciculi of which it is pressed onward and lodged in the stomach.

Though this is the mode in which deglutition is executed, these several performances, when the food is masticated, so quickly succeed one another that the act itself may be said to be but momentary; indeed, so rapid is the succession of them that to the common observer these operations appear to be simultaneous. To shew that the aliment does pass into the stomach by

muscular agency, and that gravitation has nothing to do with the act, we have only to remark that a horse swallows as well with his head dependant as he does with it erect, indeed, the act of drinking, which is a very curious one, is itself a demonstrative proof of it. The way in which drinking is conducted, is this:—The lips being immersed in water, and separated for its admission, the tongue is rendered concave upon its anterior surface, and projected in close contact with them, along whose hollowed dorsum, as along a channel, the fluid mounts as it is imbibed by suction: the want of such previous collocation of these parts, occasions the confusion in swallowing when we drench a horse. The animal exerts the power of suction, by first rendering his mouth inaccessible to the external air, and then forming a vacuum in it by inspiration, into which the water rushes from the pressure of the atmosphere upon its surface,—as into the cylinder of a syringe: flowing along the tongue into the pharynx, it ascends (should the horse be drinking from a pond) in consequence of the contractions of these parts, in successive portions, by the groom called *go-downs*, through the esophagus into the stomach.

I shall now take into consideration the

Physiology of the Stomach.

A SUBJECT of vast importance to the practitioner of human medicine, and one of no inconsiderable moment to him whose professional avocations are of a veterinary nature. It is an axiom in pathology, that unless we are acquainted with the natural habits of an animal, we are incapable of arriving at a knowledge of its diseases, *ergo* incompetent to treat them, and this principle

applies with equal force to every individual organ of which the animal is composed—for unless we can recognise healthy structure and economy, how are we to detect morbid appearances and actions, and to prescribe remedies to palliate or remove them? In order that we may have clear and correct notions of the physiology of this organ, let us first consider the functions of its several parts separately; then, the process of digestion as far as regards the stomach itself; and lastly, the natural habits of this animal, in respect to his mode of living: knowledge that will qualify us to form an opinion how far his domestic treatment, or "stable management," is calculated to preserve this important organ in a state of health.

First of all let us inquire why Nature, who has given four stomachs to the ox and sheep, should have restricted so large an animal as the horse to one and should have made that one much smaller, in comparison to the bulk of his body, than those of man and quadrupeds in general: a fact of which I have already given some demonstration by actual comparative admeasurement. And what makes this investigation the more curious and interesting, is, that although the stomach of the horse will contain so little, his consumption of food is not only greater than that of carnivorous and many other animals, but the aliment on which he lives is of that kind which necessarily occupies very considerable space, either in or out of the body. A man probably will consume about a pound-and-a-half of solid food at a meal; a horse, we will say, about six pounds, all, or a great proportion, of which may be hay; and this, in respect to bulk, will occupy twelve or even twenty times the space that a pound-and-a-half of any

sort of cooked meat or vegetables will; and yet the stomach of the latter will not contain three times as much as that of the former! One natural and self-evident conclusion from the foregoing facts, is, that the food which a horse eats cannot remain long in his stomach—that portions of it must successively pass into the intestinal canal, at short intervals, during the time of feeding, in order to make room for those last swallowed. We may also fairly draw this inference: that the stomach cannot, either in the empty or distended state, occupy so much space in the abdomen of the horse as it does, *cæteris paribus*, in those of other quadrupeds; consequently all parts in its immediate vicinity will be less compressed, when it is full of food, than they otherwise would necessarily have been, had it been larger. Of the contiguous parts, only the intestines and the diaphragm possess the power of moving.* Now, as the former lie principally in the centre of the belly, and as their vermicular motions do not tend towards the chest, it would appear that a large or distended stomach could not much interfere with them; but, to the muscular partition between this cavity and the thorax (the action of which has already been explained) a crowded abdomen would prove a heavy incumbrance—would oppose its recession and embarrass the breath according to the bulk, advance, and counter-pressure of the viscera in contact with it. To prove that distention of the stomach does in animals interfere with the respiration, and embarrass it in that same degree in which it is exerted, we have only to select one or two out of the many instances familiar to us all. Why is it that a man is short-winded after a full meal? or that he cannot perform exertion as be-

fore, without experiencing an uneasy sensation about the chest? Why is it that a dog, that has satiated himself with food, will not and cannot pursue his prey with his usual alacrity and speed? Finally, why is it, but from a knowledge of these facts, that we keep our racers and hunters short of food and water, prior to their being put to their arduous course?

A priori, we shall be led to expect, that the horse of all such animals must feel the least oppressed—suffer the least inconvenience from being made to exert himself on a full stomach; and that he is so endowed, and super-eminently so, as an animal engaged in the chase, every sportsman can testify; indeed, it has been said, and with much truth, by Professor COLEMAN, "that he is the only quadruped that can be compelled to take violent exertion after a full meal." It is not a very uncommon practice, though by no means a prudent one, among those whose hunters are their hacks on such occasions, to give a horse that has come nine or ten miles to cover, a *good* feed of corn prior to the hounds being thrown off, which he has no sooner eaten than he is again bridled and afterwards galloped perhaps for half-an-hour, an hour, or even two, with little or no intermission: I mention this case to show what a horse can be goaded to do, and what he is able to perform, on a full stomach. But, would the same person, if he were going out shooting, give his dog a bellyful? Or would he feed his ox just prior to yoking him to the plough? Perhaps, with regard to the dog, it may be answered that the comparison is not a fair one, inasmuch as it is altogether optional with him whether he hunt or no; but if we observe the horse in a state of nature, we shall find his habits of life to be such as not only to confirm this specific energy, but to evince that

he has not the same disinclination to take violent exercise under such circumstances that other quadrupeds have. Only watch horses at grass—how seldom do you see one lying down, or apparently disposed to rest himself, or even remain quiet; on the contrary, most of them are busy grazing, while others, vigilant and playful, are ever ready to frisk and gallop about at every frivolous cause of alarm. Indeed, in this part of his natural history, the horse appears to differ from almost all other animals. When a man or a dog has filled his stomach, no longer urged by the sensation called hunger, he refuses to eat more, and probably betakes himself to repose; but a horse, though he may have consumed twice or thrice as much as his stomach can contain, feeds on without showing any signs of satiety or inactivity. But this is not the case with ruminants; they having distended their paunch lie down and commence rumination. It would seem then, that the stomach of the horse, in comparison to that of other animals, is made disproportionably small in order to render him more effective as an animal of speed and burthen, and in course more useful for the various and manifold purposes for which he is employed by man.

What are the respective uses of the coats of the stomach? With regard to the peritoneal, it strengthens the viscus and is supposed to diminish tendency to rupture in cases of over-distention; it will also prevent friction, by continually exhaling a serous vapor from its surface.

Of the muscular coat, I have already mentioned one use, *viz.* that of accommodating the organ, in point of volume, to the bulk of the contained mass; so that it may be said, under certain limitations, *to be always full:*

when once however it has received such a quantity of food as to distend it to a certain degree, the muscular coat contracts, and by a regular and uniform compression, squeezes that portion of aliment lying next the pyloric orifice into the first intestine, at which time the valve of the pylorus arrests the passage of any gross and imperfectly digested matters. Another use of this coat, is to give to the organ a motion, somewhat similar to that of the intestines, (the peristaltic,) which contributes to the perfect digestion of the alimentary matters by more equally and thoroughly mixing them with the gastric secretions.

On the use of the third or cuticular coat, it will be necessary for me to be more diffuse; for opinions have been propagated with regard to the physiology of this part, which appear to me to be unsupported either by direct observation and experiment, or even by sound analogical deductions. It is said, that this insensible lining serves the purpose of triture—that it comminutes, crushes, or grinds the food by friction—by a similar mode of operation as, though in a less degree than, the gizzards of birds. Now in order to learn how this is, let us briefly examine the process in these animals. In birds or fowls, the grain first passes into a membranous bag, called the craw or crop, where it undergoes some preparatory mollification, before it is subjected to the action of the gizzards—organs almost entirely composed of red, fleshy fibres, whose substance and color denote the concentration of intense muscular power. Here it is, then, that the grain taken in whole (for the animal has no teeth) is bruised—is ground, in fact, as effectually as if it had been in a mill; and to demonstrate how adequately and admirably these organs are constructed for

the purpose, SPALLANZANI says, speaking of the triturative power of the gizzard, "that glass is reduced to dust by it, pieces of metal broken, and the points of needles or lancets broken off with impunity *." Seeing that all triturative power must reside in the muscular, and that none can be possessed by the cuticular coat, I was first led to doubt that the gizzard of the fowl and stomach of the horse at all resembled each other in function, from a bare examination and comparison of the organs themselves. the one I found to be intensely red, coarsely fibrous, thick, tough, and stronger, in proportion to its size, even than the heart itself; the other, though no one disputes its muscularity, has not that appearance but under close and accurate inspection, for its fibres are weak, are pale, white in fact, and in some places by no means very distinct to the naked eye; altogether the stomach seems to possess little more muscularity than the bladder, and is certainly inferior in that respect to the rectum. There is another circumstance, relative to the muscular fibres of the stomach, to which I would draw attention; which is, that those encircling the cuticular, are neither stronger nor more numerous than those surrounding the vascular lining; on the contrary, towards the pylorus they are always most conspicuous, and often palely reddened. But no one has ever given it as his opinion that the vascular portion of the stomach breaks down the food, although it possesses, to demonstration, as much power to do so as the cuticular; and perhaps no one would ever have attributed such a function to the horse's stomach at all, had it not been for the presence of this cuticular lining: it behoves us, therefore, to examine this as well as the muscular coat. Have

* Vide SPALLANZANI on Digestion.

any other parts similar coverings? Yes! the dorsum of the tongue, the roof of the mouth, and the interior of the pharynx and œsophagus have; indeed, the linings of the two latter are continuous with—one and the same substance with—that of the stomach; and we know for a certainty that these organs exercise no comminutive action: we believe that they are provided with such a covering simply to defend them from the mechanical irritation of the *ingesta*.

Let us now inquire if any, and what facts, demonstrably true, favor the opinion of trituration within the stomach, similar to what happens in the gizzards of fowls. If you feed a horse with corn and grass, and destroy him shortly afterward, you will find the former collected in the fundus, and the latter in the pyloric end, whether the corn have been given before or after the grass; in fact, it appears from many similar experiments, that that food which is most difficult of digestion, enters and remains for a time in the cuticular pouch. But I have never detected any change like trituration of it there; on the contrary, as every one knows, if an oat happens to be swallowed without mastication, it will continue whole, and will be evacuated whole in the fæces *. These facts, and the conclusions I have drawn from them, beget suspicion in my mind that all that has been said about trituration of food in the stomach only amounts to gratuitous assertion—to assertion based upon some hypothetical notions, to which I cannot subscribe even though I

* Even though oats have been deprived of their husks they will pass through indigested. Hay or straw not sufficiently divided and crushed by the grinders, may be often detected unchanged in the dung.

should fail in offering any thing more feasible on the subject.

Another particularity in the stomach, one to which I have not till now had occasion to advert, is, that the cuticular sac lies out of the course which that aliment takes that passes directly from the œsophagus to the duodenum. RICHERAND, who has noticed this circumstance, makes the following remark. "In herbivorous quadrupeds, which do not ruminate, this great fundus (the blind pouch) forms nearly one half, sometimes nearly the greater part of the stomach, as the œsophagus enters into it very near the pylorus. In some, as in the hog, the stomach is divided into two parts by a circular contraction. The food which is received into the great fundus of the stomach may remain longer in that viscus, as this part of the cavity is out of the course of the aliment." The experiments I have briefly mentioned, relative to the transposition of the various sorts of food, confirm the truth of this observation; for, the horse being an animal that is almost always feeding, much undigested matter must have escaped at the pylorus, along with the duly-converted aliment, had not the former been so disposed of. SPALLANZANI, whose valuable work on digestion abounds with interesting experiments, concluded long ago, that when the stomach contained more than one kind of food, that which was the most easily digested would be the soonest expelled, and this applies to carnivorous as well as to grammivorous animals *. This

* M. LALLEMAND, however, from some observations and experiments of his, has come to a different conclusion—"That aliments do not escape from the stomach in the order in which they were introduced, and that it is not those that are first altered by digestion

author tells us, that birds are provided with gizzards for the same reason that carnivorous or other animals are furnished with teeth—to break down or grind their food, in order to render it fit to be digested in the proper stomach. "In ruminating animals, such as sheep and oxen, which have four different receptacles for food, the hay or grass descends immediately into the first and second of these, in nearly the same state in which they were browsed. Here (continues SPALLANZANI, from whom I am now citing) they are softened by the great quantity of the gastric juices, as seeds in the craw of birds with gizzards. But as the stomachs of ruminating quadrupeds have *no sensible triturating power*, and the food requires trituration, Nature has wisely provided for this by causing it to ascend, in consequence of a gentle stimulus to vomit, into the cavity of the mouth, where, by means of rumination, it receives the necessary predisposition to be digested by the gastric fluid, as happens to the food in the stomachs of graminivorous fowls, after it has been properly triturated by the gastric muscles." In the page preceding that from which these observations were extracted, the author remarks, "that the horse does not chew the cud, *but resembles the ox in the membranous structure of his stomach, and the food upon which he lives.* I was therefore desirous (continues SPALLANZANI) of seeing what changes masticated plants would undergo by continuing a certain time in the stomach of this quadruped also, (the horse,) inclosed

that make their exit first; it is those, on the contrary, which containing the least alimentary matter, are most obstinate in the digestive process."

as usual in tubes. Here too they were digested, as I learned from some lettuce and trefoil enclosed in two tubes, which were voided in fifty-two hours." Had these tubes sustained any injury, contusion, or material alteration of form, in their passage through the alimentary canal, there can be no doubt but this accurate observer would have noticed it: we may therefore conclude, as SPALLANZANI's opinion, that the stomach of the horse possesses *no sensible triturating power*; indeed his assertion, "that the horse resembles the ox in the membranous structure of his stomach," amounts to a full acknowledgment of it.

LECTURE L.

Physiology of the Stomach continued.

I ENDEAVOURED in the last lecture to shew the invalidity of that opinion which attributes a triturative power to the horse's stomach, alike in kind, but less in degree, to what is possessed by the gizzards of birds. I stated, that these organs were altogether unlike each other; the one being a thin musculo-membranous bag, the other a thick and strong hollow muscle; that the latter was possessed by an animal having no teeth, the offices of which it performed by triture; that the cuticular coat itself of the stomach could not act, and that it existed in other muscular parts where no such function was carried on; that if, from any cause, the horse did not sufficiently masticate his food, it passed through his intestinal canal indigested; and finally, that my observations confirmed SPALLANZANI's inference, that the stomach of the horse resembled that of the ox in having no "sensible triturating power*."

* "It has also been conjectured that the cuticular or insensible portion performs the office of grinding the food, somewhat similar to, though in a less degree than, a gizzard. But, if the insensible portion of a horse's stomach performs the office of a gizzard at all,

It will now naturally be asked, what I consider to be the specific use of the fundus or cuticular portion of the stomach? Though an opinion may be thought precocious from me on a subject regarding which I am ready to confess my observations and experiments have neither been numerous nor varied enough to render me very tenacious of such inferences as I may venture to deduce, I cannot abandon it altogether without hazarding the solution I have formed in my own mind of this very interesting physiological question. As far as respects the blind pouch itself, without any regard to its lining, it appears to have been formed for the purpose of withdrawing a portion of the food from the regular course of the alimentary canal, and detaining it until such time as it be fit for the operation of the gastric juice. Now the questions are, whether the food undergoes any changes during its stay in the fundus, and, if it does, what those changes are. It is evident that the cuticle of itself can perform no glandular function, nor do we find that the aliment deposited in this part undergoes that conversion which it does in the vascular end; in which respect, the fundus bears a similarity to the craw of the fowl*, and paunch of

(a fact which I very much doubt,) it must be inconceivable, and even indeed, inasmuch as we find that oats which have escaped being crushed by the teeth, though moistened with saliva in the mouth, and afterwards soaked with the juices of the stomach, are not burst or broken down in this organ, but are uniformly voided whole, in every case where the husk, over which the gastric juice has no power, remains entire. But, though, we cannot say what the peculiar office is which the cuticular portion of the horse's stomach performs," &c. Vide Professor Pavet's Work on the Diseases of Horses, page 306.

* In birds that usually feed on grain, as the common fowl,

the ox or sheep *. Both these organs detain the food until it has suffered some change, a change which, though not absolutely necessary to its mastication and subsequent digestion, will very materially facilitate both those processes; and this change appears to be purely of a chymical nature—to consist in its being rendered soft by maceration † in a mucous secretion, which is poured

turkey, pheasant, &c. the œsophagus becomes dilated within the breast, and forms a *cul de sac*, in which the food is detained until it is softened by maceration in a mucous secretion, furnished by glands underneath its cuticular lining, preparatory to its trituration in the gizzard.

* In the ox (and other ruminating quadrupeds) there are four stomachs. The first, called the *paunch*, a muscular bag lined by a thick cuticle, receives the food imperfectly masticated, and without commixture with the secretions of the mouth. The second stomach called from its being composed internally of numerous thin folds, the *honey-comb bag*, is also lined by cuticle, and like the first is but a reservoir for unmasticated food: it would appear, however, to be rather a receptacle for water, while the first contains meat in a tolerably dry state. Now these parts are so connected to the œsophagus, that the animal can at pleasure regurgitate the contents of the paunch into the mouth, and there masticate them, and mix them with the salivary juices, in order to prepare them for the digestive process: this is called *rumination*, or *chewing the cud*. On being swallowed again, the aliment passes into the third stomach, denominated the *many plies*, which like the second is traversed by thin membranous folds, and lined with cuticle. The fourth stomach, or *red bag*, at length receives it, and here it is that the process of digestion may be said to be begun, and to be nearly completed; hence it has been designated the *true stomach*: that this is the case, we may infer from all the others being covered by cuticle, from the elaborate preparation that the food has already undergone, and from the smallness of the alimentary canal in comparison to the capacity of the four stomachs.

† "The hay and grass descend immediately into the first and second stomachs, in nearly the same state in which they were browsed. Here they are softened by a great quantity of gastric

upon it through numerous orifices in the cuticular coat*. By maceration, the cohesive force of the most solid substances may be overcome, but it will not change their nature; added to which, we can demonstrate that the aliment does not undergo digestion in these cuticular sacs; it is not very improbable, however, that incipient fermentation may take place in them, even under ordinary circumstances, and that it does occasionally and to a very alarming extent in ruminants, the disease called the *hove* sufficiently proves to us, which in fact is nothing more than the generation of air from the fermentation of green food in the paunch†.

Now, then, let us see how we are to apply these facts to what happens in the cuticular portion of the horse's stomach. Is it not probable (since we deny its triturative power) that the food undergoes here such preparatory mollification as not only renders it perfectly innocuous, in a mechanical point of view, prior to its entrance into the sensible and vascular part of the organ, but, also, more susceptible of the action of the gastric juice? The husks of beans and oats, the stalks of hay and straw, furze, twigs of trees, &c. might, one or other of them, prove irritating to the delicate and sensitive villi of the stomach did they not first lie for a time steeped in mucus in the fundus ‡, and that these substances

juices, as seeds in the craw of birds with gizzards." Vide SPALLANZANI on Digestion.

* SPALLANZANI found by introducing sponge into the crop of a turkey, that he could express from it about seven ounces of mucus, after it had remained there ten hours.

† Vide Lecture xliv. on Diseases of the Stomach.

‡ The dog excites vomiting by eating grass, an effect that appears to be attributable to mechanical irritation of the villous coat of the stomach

would be more readily digested, in consequence of being softened, no one, I should think, would be inclined to dispute: and now we perceive the reason why that provender which is hardest, less digestible or more difficult of solution than other, is lodged for a time within the fundus. Had the stomach been lined throughout with the vascular coat, probably the animal would have required a paunch, as a preparative receptacle; since, however, the food does not require long to be softened, in consequence of its being already masticated and mixed with saliva, such an inconvenient appendage is wisely dispensed with *. In a word, I regard the fundus as a dilatation of the œsophagus—as a sort of paunch or craw, in which the aliment, lying insteeped in a mucous fluid in a certain degree of heat, not only becomes softened, but probably undergoes a change approaching to incipient fermentation † prior to its

* Indeed the similarity in structure, as well as function, of the horse's stomach to the paunches of ruminants, is much greater than we should at first view conceive. It is true that the capacity of the cuticular portion of that of the former, bears no proportion to that of the stomachs of the latter; but then, we are to remember that the horse requires no receptacle for unmasticated food. With regard to the vascular part of the horse's stomach, how much difference is there in the extent of it and that of the fourth stomach of the ox!—for that is the only fair way of comparing their *digestive* organs.

† "Gosse, of Geneva, found by experiments on himself, that animal and vegetable matters, concrete albumen, the white and tendinous parts of animals, pastes made with fat and buttery substances, *unfermented or slightly fermentable matters*, remain longer in the stomach than the gelatinous parts of animals and vegetables, *fermented bread*, &c., that the latter only required an hour for their solution, while the former were hardly dissolved in several hours."—"However various our aliments may be, the action of our

being subjected to the action of the true gastric juices. It does not seem to be absolutely necessary that the food should undergo this preparatory process however, nor does every kind appear to require it, for we know that if grass and corn be eaten about the same time, the former will (after a short detention) pass *directly* through the stomach into the duodenum, while the latter will remain within the fundus. Now, if we reflect upon this fact, and bear in mind that the horse in a state of nature is almost incessantly feeding, we shall develope another apparent use of the blind pouch. In consequence of its first receiving the food that is swallowed, it is probable that no sudden commixture of raw or crude matters (unless they be very digestible) with those already in a state of digestion ever happens; a circumstance that might have been productive of disturbance and imperfectness in the digestive process, and given rise to the escape of unchanged particles of aliment into the intestinal canal, for, if a horse be fed on but one and the same sort of meat, it appears to me, that a regular and successive supply of it is conveyed to the pyloric end, through the intervention of the fundus, and that none is directly transmitted into the former from the mouth of the esophagus.

The aliment having been passed into the left, villous, or pyloric extremity, designated by some as the only *true* stomach, is mixed with a fluid called the gastric juice,

organs always separate from them the same nutritious principles 'There is but one food, but there exist several forms of food.' The most nourishing of vegetable matter is the amylous fecula, which is more easily digested, *from having undergone some fermentation*, hence, *leavened* bread is the best of vegetable aliments" Vide RICHERAND's Elements of Physiology

supposed to be a secretion from the villi with which its internal surface abounds. Before I inquire however into the secretion and properties of this fluid, and its use as a digestive agent, it will be proper to make a few comments on those mechanical and chemical operations formerly had recourse to, to explain the phenomena of digestion. Seeing that the food, soon after its admission into the stomach, was reduced to a soft uniform mass, and that its properties were not only assimilated, but altogether altered, the ancients conceived that this change was effected in a slow and gradual manner by a process something similar to boiling, or rather to that of maturation in the living body, which they called *coction*; but, since those notions have been discarded by which the doctrine of concoction was upheld, the hypothesis itself has fallen to the ground.

In later times, *fermentation* has been offered to account for these changes; those, however, who have taken most pains to develope the nature of digestion, and are most acquainted with the process of fermentation, are best convinced of the inadequacy of the latter to explain the phenomena observable in the former operation. As fermentation is purely a chemical process, if digestion were conducted on the same principles, we should be able to imitate the latter out of the body by procuring such fluids as are produced in the stomach: this, however, we cannot accomplish. Again, if the food fermented, the products ought to be such as arise from fermentation of similar substances out of the body; whereas, they are altogether different. It does happen, it is true, now and then, that the food ferments; but this circumstance tends to confirm all that has been said against fermenta-

tion, inasmuch as it is ever the result of defective digestion, and then the products proper to fermentation make their appearance—such as gases, acids, &c. giving rise in the human subject to *wind on the stomach*, and to *hoove* or flatulency in horses and cattle.

Those who have discoursed of digestion as a species of putrefaction, the experiments of SPALLANZANI have silenced. That persevering experimentalist has proved, that meat and other substances taken, or forcibly introduced, into the stomach of an animal, in a state of putridity, were entirely deprived of their putrescent quality; and that if flesh was eaten in a recent state, it had not time to run into putrefaction before its gastric digestion was effected.

Of trituration and maceration, I have already spoken. Let us now proceed to consider what are the immediate digestive agents, as far as regards the stomach; for it may be here observed, that the aliment is still much elaborated after its admission into the intestinal canal, where the process of digestion, begun in this organ, is perfected. From numerous experiments on digestion, made on animals of different orders, genera, and species, among which those of SPALLANZANI are chiefly entitled to our consideration, it appears, that this process is effected, as far as regards the stomach, by the action of a peculiar fluid, with which the aliment is mixed, called the *gastric juice*. In consequence of the remarkable properties that this fluid is known to possess, various expedients have been adopted from time to time to collect it, that its chemical composition might be correctly ascertained: it is found extremely difficult, if not impossible, however, to obtain it in a state of abso-

lute purity *. Its peculiar power of coagulation, every one is well acquainted with who has noticed the common operation of turning milk: what is called *rennet* by those engaged in the business of the dairy, is nothing more than the stomach of a calf, prepared in some particular way, which owes its coagulating power entirely to the presence of gastric juice †. So retentive is the maw or red bag of this power, or rather so little destructible is this property of the gastric juice by any common operation, that the stomach may be washed, or even dried to a skin, and it will still have the same effect on milk. Milk then, the serum of the blood, and any kind of jelly, introduced into the stomach, are coagulated prior to being digested: a fact infants afford demonstration of, when their stomachs are disordered, in rejecting the milk in a coagulated state. But the most extraordinary property of the gastric juice, is that of

* Spallanzani procured it first of all, by fasting animals, and then killing them. In this way he collected some from the gizzards of turkeys and geese, and, after a fast of two days, thirty-seven ounces from the two first stomachs of a sheep; the latter was green, obviously the effect of some plants, which still remained in the stomach. In order to obtain a still larger quantity from birds, this ingenious experimentalist put bits of dry sponge into metallic tubes full of small holes, and introduced them into the œsophagus and stomach of a crow: three of these little sponges afforded 37 grains of gastric liquor of a turbid yellow color. This zealous inquirer next obtained a quantity of gastric fluid by exciting vomiting in himself, by means of tickling his fauces, the very unpleasant feelings, however, this experiment created, forbid its repetition: the ejected fluid was frothy, somewhat glutinous, deposited a small sediment, and became as limpid as water.

† To prove that this property was confined to the internal coat, Spallanzani mixed small pieces of the muscular and peritoneal coats with milk, without producing any such change.

being —I might almost say—an universal solvent the hardest bones—nay even ivory itself has been eroded and dissolved by it in the stomach of the dog. If the solvent energy of this fluid be in an inverse ratio to the muscular strength of the coats of the stomach *, we may conclude that it is as potent in the horse as in many carnivorous quadrupeds; it would appear, however, from some experiments of SPALLANZANI, that it rather exceeds in quantity than in strength in ruminants, for in six tubes containing wheat in the form of seed, flour, and bread, two of each sort, the one masticated the other not, the latter were not at all dissolved though soaked in gastric fluid, whereas the former, which had been previously reduced to a coarse paste, were in a great measure consumed: even pieces of plants (according to this author) given to the ox in this way, without previous maceration, were but slightly affected, and their color only a little faded. That the stomach of a horse will digest animal food has been proved by some trials that were made at the Veterinary College to support one on flesh alone †. It was given,

* Vide Rees's Cyclopædia, article "Digestion."

† "Thus we read of animals naturally herbivorous, as *horses*, sheep, and oxen, gradually quitting their usual aliment and learning to *live on flesh*. I too can produce a recent instance in a young wood-pigeon, a species of bird universally known to live on any thing rather than flesh. By dint of hunger, I brought it gradually to relish flesh so well, that it refused every other kind of sustenance, even grain, of which it is naturally so fond. Such changes, whether effected by design or accident, will not excite the smallest degree of surprise in those who know that, of the various kinds of food used by man and animals, the gelatinous part supplies the nutriment; and this exists alike in vegetables and animals. The example of the eagle among carnivorous, and the *horse* or pigeon

by being made up into balls, for the space of a month; the animal, however, gradually fell away in condition, and at length became emaciated: a result, probably, not more attributable to the change of diet than to the insufficiency of the quantities in which the flesh must have been supplied. Another peculiar quality of the gastric juice, is its potent antiseptic efficacy. Putrid pieces of flesh thrust by SPALLANZANI into the stomachs of ravens, owls, &c. lost their offensive odor, and were found to have perfectly recovered from their putrefactive state: they underwent degrees of correction according to the time they were suffered to remain in the stomach; but if they were confined in the esophagus, no amelioration could be detected—indeed the contrary was generally remarked.

The aliment, then, having been pressed, by the peristaltic action of the stomach and the admission of fresh food, from the cuticular into the vascular pouch, is there mixed with the gastric juice, which not only destroys its remaining force of cohesion or aggregation, but exerts a solvent power on certain parts, converting them into a fluid, but leaving the innutritious or indigestible matters (such as the husks of corn or fibrous parts of hay and straw) swimming in it: this fluid, which is called *chyme*,

among herbivorous animals, does not however warrant us to conclude, that the former can be universally converted by art or chance into the latter, and reciprocally; for, on the other hand, RÉAUMUR's kite and my owls and falcon were incapable of digesting vegetable substances, not that these substances are incapable of affording them nourishment, but because the gastric liquor is incapable of decomposing them and extracting the nutritious jelly."—SPALLANZANI on Digestion.

has a sour, penetrant odor, and varies its color—which is generally green or yellow—with the nature of the aliment. This change is earliest perceivable upon the surface of the alimentary mass, where it first receives the impregnation of the gastric juice, gradually it extends in every direction until it has pervaded the whole. At this time, the valve of the pylorus is sufficiently contracted to arrest the escape of any gross, undissolved matters, but the chyme flows through as it is formed, for, as I before remarked, the aliment does not quit the stomach in the order in which it entered, but according to its digestibility or convertibility into chyme. In the horse, the gastric process of digestion is very active, and it was necessary that it should be, for, he being an animal that feeds beyond what in others constitutes satiety—distention of stomach, chyme must be continually flowing out in order to make room for the aliment he continues to take in. The duration of this process, however, will vary with the nature of the aliment, and probably with the age and temperament of the animal himself. It is evident that water must flow at once through the organ, without any detention whatever; and we may easily conceive how it can do so without disturbing the contents of the blind pouch; when it meets with solid matters however, in its way, they are apt to be washed through the pyloric orifice: hence it is a bad practice to give water soon after a feed of corn; for indigested provender in the intestinal canal will have the same effect as—and is indeed—so much extraneous matter, and in this manner the presence of oats in the bowels may excite a diarrhœa.

I shall conclude this lecture with the relation of two

experiments, which tend to confirm what has been said on gastric digestion, by showing what passes in the stomach under ordinary feeding*.

* December, 1823. A young female ass was taken up from grass and kept fourteen hours without food or water. A quartern of oats was then given to her, which she ate in 25 minutes. Six hours afterward she was bled to death. The stomach contained both grass and corn; the former occupied the vascular part, and the boundary line between it and the corn which all laid in the cuticular pouch, precisely corresponded with that formed by the borders of the sensible and insensible linings. The grass was dark-colored, soft, and pulpy, and had much the appearance of chopped or mashed boiled-spinage. The corn preserved its color, was sheathed in a layer of mucus, was humid, and emitted a faint, sour odor.

December, 1823. A chesnut horse (glandered and condemned) was kept without food and water for 18 hours. A quartern of oats was then thrown into his manger, which he ate voraciously; six hours and a half afterward he was bled to death. The stomach was moderately distended with air, which, when liberated, emitted an offensive smell. Most of the corn was lodged in the fundus. Its color was unchanged, though it was converted into a soft, humid mass, consisting of husks, kernels, and parts of kernels, from which could easily be expressed a yellow liquor, very like the first milk that a cow gives after calving; into which indeed the remaining undissolved kernels were convertible by a little trituration between the fingers. The vascular part was filled with this fluid, and in it were floating numbers of the husks: many of these had the appearance of entire oats, but on squeezing them they proved to be empty husks. The duodenum also contained much of this fluid, but therein it had a whiter appearance.

LECTURE LI.

Physiology of the Intestines.

THUS far, I have endeavoured to develope the process of digestion in the stomach. We have seen that the aliment becomes therein converted into chyme, and that the chyme passes into the duodenum. The ultimate design of digestion, is the separation of the aliment into nutritious and innutritious or excrementitious parts, and how this, the consummation of the process, is accomplished, we are about to inquire in tracing the progress of the chyme through the alimentary canal.

I have already observed, that the duodenum receives the hepatic and pancreatic secretions, and that these enter either by one common opening, or by adjoining orifices; here they become mixed with the chyme, as it flows through the pylorus: and now the process of *chylification*—the conversion of the nutritious part of the chyme into chyle, may be said to be begun.

In my lecture on the pancreas, I remarked that it was a gland of much similarity in structure to the salivary glands, and that this analogy appeared to be confirmed by a comparison of their respective secretions: for,

although the operation of procuring the pancreatic juice is one attended with many difficulties, enough of it has been obtained, I believe, to determine its resemblance to saliva. Now we cannot for a moment entertain a doubt that the pancreatic juice is of great —nay essential service in promoting digestion, and yet we are, in truth, confessedly ignorant of its precise use in the process. It is believed by some to possess a solvent power, something similar to that of the gastric juice, whereby it completes the solution of any matters that may have escaped the pylorus in an unchymous state; others suppose that it effects a more perfect separation of chyle from the chymous mass. Whether one or other or neither be its operation, it does not appear to be so essential an agent in the production of chyle as either the gastric juice or the bile, for in dogs the communication has been cut off altogether between the pancreas and duodenum (so that the chyme was entirely deprived of this fluid) without the manifestation of any very obvious signs of impaired digestion. Far be it however from me to imagine that Nature would have formed a gland of the size of the pancreas, and furnished it with an excretory duct for the purpose of conveying its secretion into the duodenum, if some end, and that a wise and important, though hitherto mysterious one, had not been answered by it in the process of chylification.

Of the use of the bile we have far less equivocal notions; though, on this point, there has been a variance of opinion, which Mr. Brodie has gone far to harmonize by some very decisive and satisfactory experiments. This faithful observer found, that "where a ligature had been applied so as to obstruct the choledoch duct, (of young cats,) the production of chyme in the

stomach took place as usual; but the conversion of chyme into chyle was invariably and completely interrupted. Not the smallest trace of chyle was perceptible either in the intestines or in the lacteals." "I conceive that these experiments (continues Mr B.) are sufficient to prove, that the office of the bile is to change the nutritious part of the chyme into chyle, and to separate from it the excrementitious matter." But, in the horse, the bile, which is poured into the gut probably at the same time with the pancreatic juice, does not appear to exert its influence so rapidly as in carnivorous animals: chyle seems to be less quickly developed as the aliment continues its passage. In this process, it is said that the bile itself separates into two parts, a serous and a resinous one, and that the former, mixing with the chyle, is reconveyed with it into the circulating mass*; while the latter, combining with the fæces, tinges them of a brown or yellow color, and is ejected with them as excrementitious. To this, by some is added another use, and one that, no long time ago, was regarded as its principal virtue—that of acting as a stimulus to the peristaltic motion of the intestines, whereby a regular and natural discharge of the excrement is maintained. The facts, however, by which this opinion has been upheld, appear to be of a very questionable nature: indeed Dr. Copland goes so far as to say "that we have no more proof that it (the bile) acts as a purge than that it performs the office of an astringent. How is it (he adds) if this opinion be correct, that diarrhœa, or a lax state of

* Dr G. Lordyce, however, in his "Treatise on Digestion," says that the bile does not unite with the chyle itself, and pass along with it through the lacteals into the blood.

bowels, is so often observed during interruptions of the biliary secretion, and especially of the cystic bile *?"

I stated, at another time, that the horse had no gall-bladder, and that the bile consequently passed into the intestines as fast as it was secreted in the tubuli biliferi of the liver: why so apparently useful a part of the digestive apparatus, and one which is found in most other animals †, as in the ox, sheep, dog ‡, hog, &c. and in the human subject ¶, should be wanting in horses, is a question of some interest; and one which now engages our attention. Before I proceed however to inquire why Nature has not furnished horses with gall-bladders, let me cursorily point out what purposes such an organ serves when present. That it is a receptacle for the bile is sufficiently evident: it invariably contains more or less of that fluid after death; and during life, as its secretion is probably always going on, bile must have been continually flow-

* Richerand's Physiology, fourth Edition, with Notes and Appendix. By J. Copland, M.D.

† The rat and the mouse (whose stomachs so much resemble the horse's) have no gall-bladders; the stag, the elephant, the camel, the dromedary, and rhinoceros may be added to this list. In the elephant, the gall-duct presents a considerable dilatation in its course from the liver to the intestines.

‡ In the ox, sheep, and dog, there are several ducts which convey the bile directly from the liver into the (cervix principally of) the gall-bladder, called the hepato-cystic.

¶ In the human subject there are three distinct ducts, the ductus hepaticus, which conveys the bile from the liver, and the ductus cysticus, which conducts it to and from the gall-bladder; these unite, at a sharp angle, and form one common duct, called the ductus communis choledochus, which carries the bile into the duodenum.

ing into the intestines, whether aliment was passing or not, did not the hepato-cystic or cystic duct convey it from the liver to the gall-bladder. Moreover, the gall-bladder serves to improve the quality of the bile by detaining it until its thin or watery parts have been absorbed: cystic bile is more concentrated, viscid, yellow, and bitter than hepatic. For it would appear that, in those animals furnished with gall-bags, the intestines receive only an occasional supply of bile, but of bile that is thicker and more efficacious than that which comes directly from the liver, whereas, in those that are not there must be a continual flow of bile (supposing its secretion to be going on during digestion without intermission) of a thinner and less active kind, into the alimentary canal: in the latter, the quantity appears to make up for the quality.

Now, let us for a moment revert to the natural habits of the horse. He is an animal almost always feeding; it follows, therefore, that the stomach must be as continually expelling chyme, and that there must be as regular and frequent an influx of chyme into the alimentary canal *. How admirably this chimes with the uninterrupted supply of bile! And equally consonant with these facts are the apparent designs of the peculiarities of structure of the large intestines. Whereas, in those animals that have gall-bladders, the supply of food to the stomach is occasional, its transmission into the

* Other animals, as I observed before, feed only at certain times: if they be ruminant, the intervals are employed in chewing the cud, if carnivorous, in repose. Precisely the same thing may be remarked with regard to the evacuation of the faeces, the dog may void his excrement once or twice a day, the ruminant four or five times, whereas the horse will dung every hour or two.

duodenum occasional, and the influx of bile occasional; and so advanced is the digestive process in the stomach, or so little further elaboration does the aliment appear to require, that a quick and an occasional peristaltic action was required.

The *peristaltic action* means those alternate, vermicular contractions of the muscular coat of the intestines by which the alimentary mass is made slowly to pass from the pylorus to the anus. These motions, which may be seen by laying open the abdomen of a live animal a few hours after feeding, are not performed in regular succession, nor are they simultaneous; the guts appear to move backward as well as forward, and different parts of the tube are agitated in irregular alternation.

The chyme in its course, principally in the jejunum and ileum, is further attenuated by the admixture of a quantity of fluid, secreted by the villous surface of the intestines, called the *succus intestinalis*: this has been vaguely supposed to be analagous in its properties to the gastric juice. In addition to this, the chyme probably mingles with some of the mucus furnished by the numerous follicles over which it passes.

Before I proceed further with the course of the aliment, I shall say a few words on chyle. Chyle is a fluid resembling milk, is the nutrient product of digestion, and is absorbed by the lacteals, and by them conveyed into the thoracic duct. It is a nice and difficult operation to collect chyle in sufficient quantity to examine its properties; for if we kill an animal after a full meal (which is the only means we have of obtaining it) we must content ourselves with what small quantity the thoracic duct may contain at the time *. About three minutes

* The mode of obtaining chyle is this. About an hour after an animal has been well fed, having first deprived it of sensibility (by

after chyle has been let out, it coagulates; though, like blood, it will remain a very considerable time fluid if confined within its own vessels. By coagulation, it separates a thin fluid, which differs from the serum of the blood in being white, as if a little milk had been mixed with it; it is analagous to serum, however, in concreting into albumen on exposure to heat. The solid part, like the coagulum of the blood, is composed of fibrine. The following analyses of animal and vegetable chyle were made by Dr. Marcet*.

Specific gravity 1021.

ANIMAL CHYLE.	Parts.	VEGETABLE CHYLE.	Parts.
Water . . .	89	Water . .	$93\frac{6}{10}$
† Incipient albumen .	$1\frac{7}{61}$	Incipient albumen .	$4\frac{8}{10}$
Perfect albumen, slightly colored .	$4\frac{8}{10}$	Perfect albumen . .	$\frac{4}{10}$
Fibrine	$\frac{8}{10}$	Fibrine . . .	$\frac{6}{10}$
Salts . . .	$7\frac{1}{10}$		

From these analyses, we find that animal chyle contains more solid matter than vegetable; it is therefore, in that ratio, more nutritious. Another difference between them, and one in which they bear considerable affinity to the blood of carnivorous and herbivorous animals, is that animal chyle runs more speedily into the putrefactive state than vegetable ‡.

putting it or some such measure thus open the chest when having turned the right lung aside, you will perceive the thoracic duct filled with chyle. Before you proceed further wipe out the chest with a clean napkin, then, with a fine fine cancet, puncture the duct and collect the fluid in a watch-glass.

The former taken from a dog fed on animal food the latter from one subsisted on vegetables.

† Not perfectly formed

‡ Vide Part I Lecture ii page 17

The chymous mass having been received by the large intestines, and its return prevented by the valvula coli, is transmitted in part to the cœcum, and in part to the colon; what portion of it the former receives must be regurgitated into the cœcum caput coli, and pressed through the colon, after the other, before it can continue its passage: it is evident, therefore, that the aliment which the cœcum receives must be detained for a longer time than any other. In the human subject, there is a structure resembling in miniature the pouch of the cœcum; but its size is so inconsiderable that physiologists do not know what use to assign to it. In the horse, the cœcum is generally supposed to perform some office analogous to that of the stomach, and thence has been drawn a comparison of it to a "second stomach." There are two facts however that weaken this opinion: one is, that all the alimentary matters do not pass into it; the other, that it commonly contains water; I would therefore rather regard it as a *water stomach* than as a digester of food. If you give a horse a pail of water, and kill him shortly afterwards, you will find much of it in the cœcum: this simple fact shows that it was especially designed as a receptacle for fluid. And it does not demand much cogitation to assign a reason why the horse should require such a reservoir for water, when we are acquainted with his habits of drinking. A man will drink about half-a-pint at a time, and he will repeat this at four or five intervals in the day; but a horse will take in three or even four gallons at a draught, and will do this three or four times in the course of twenty-four hours. With regard to the man, his stomach can contain it; but the greater part

appears to mix with the aliment in the small intestines, and there to become absorbed: not so in the horse, the stomach cannot hold it, unless it be quite empty at the moment, which it hardly ever is, the consequence is, that it flows into the small intestines, and the bulk of it we find to be received by the cœcum *.

* The quantity of water consumed by a horse, will depend very much however upon the quality of his food. A horse kept upon green meat alone, will drink about two pailsful (six gallons) in the course of the day; fed on dried provender, he will take a pail-ful three or perhaps four times in the day.

A singular, nay, almost incredible case of *polydipsia* (morbid thirst, occurred some years ago in the practice of my father, which I shall here give his own account of. "About the beginning of October, 1810, I was requested to visit a black gelding, the property of Mr Banks, of Deptford. This gentleman, who had possessed the horse but a few weeks, informed me, that the animal had *knocked up* in two or three journeys, and that of late he had refused his food, though he appeared to have a vehement desire for water, which, I understood, had been allowed in but sparing quantities. The animal showed some general signs of ill health: his coat was long, rough, and staring; his belly tucked up; and he perspired freely from moderate exercise. His principal malady, however, seemed to be of a pneumonic nature, to relieve which, the common remedies, such as bleeding, blisters, &c. were resorted to. At the same time, I recommended his having water-gruel to drink instead of plain water. On my next visit, the servant complained to me of the horse's extreme thirst, which he said was such 'that his whole time was taken up in making water-gruel,' and his master (probably at his instigation) wished me to take the animal under my immediate care, (to Shooter's Hill,) which I accordingly did on the 3rd of November, by placing him at livery at the inn opposite my house. In the course of a day or two, the ostler discovered his appetite for drink, and represented to me that he consumed 'all the gruel he could make for him.' At this time, I must acknowledge, my hopes of recovering my patient (from a malady of the nature of which I was confessedly ignorant, were

Now, for the sake of elucidation, let us suppose that the horse had no cæcum, and that its deficiency was

declining, when, on visiting him as usual on the 5th and finding that his inordinate desire for liquids had not by very large potations of gruel been appeased I resolved to ascertain, whether it was the gruel after which he craved, or whether he had really a preternatural thirst Now, it was about eight o'clock, *a m* and he had already taken his usual allowance of gruel, when I ordered the man to fetch him a pail of water; this he ravenously drank, another as greedily, a third was swallowed with equal avidity, a fourth quickly disappeared, and a fifth followed About a quarter before one o'clock I repeated my visit, and having found my patient by no means uneasy from the twenty gallons of water (the pail having been measured) he had already ingurgitated, I was willing to see if he had any inclination to renew his potations Accordingly, another pail of water was offered to him, having drunk which, apparently with undiminished avidity, he looked round in my face with eagerness for a second, this was followed by a third, a fourth, and a fifth in fact, between eight *a m* and one *p m* he swallowed the prodigious quantity of thirty-eight gallons and one quart! Having at length quenched a thirst which I, at one time, almost began to despair of doing, no more water was given to him during that day, and medicine was altogether discontinued. This enormous ingurgitation, as was fore-thought, was speedily followed by profuse discharges of urine, and in this way the bulk of the fluid appeared to have been disposed of, for no diarrhœa ensued, nor was there any consequent sensible perspiration "

"From this time I may date the recovery of my patient His appetite, before defective and declining, improved daily; his desire for water, though still remarkable, was not to be compared to what it had been; for, from the 5th to the 13th of November he drank, on an average, not more than eighteen gallons *per diem*, his coat, before rough and staring, grew fine and sleek, in fine, he became rapidly convalescent, recovered his condition and spirits, and was in a few weeks sent home and put to work again."

"After an elapse of three weeks or a month, I met with him again, in harness, in the course of which interval, he had so much

supplied in the enlarged dimensions of the colon. In this case, the water must have been received by the colon. But what would have been the probable consequences of such a rapid and sudden influx into an intestine already full, or partly so, of chylous and excrementitious matters? This mass must have suffered such dilution that its passage through the contracted and contorted parts of the colon could not have been materially retarded, or rather its stay could not have been prolonged, and diarrhœa would have been the consequence whenever the peristaltic action was hurried: to corroborate this, we have only to advert to the fact of purgation being often induced by exercise in horses whose bowels, at the time, are distended with water. Hence, sufficient time would not have been given for the absorption either of the water, (which itself must have washed away chyle from the small intestines,) or of those chylous matters the residuary chyme may, and I conceive does, contain. But, as it is, the water, or the bulk of it, stagnates in the cœcum; whence it is taken up by the absorbents, to be ultimately excreted through the urinary emunctories: a conclusion, the case I have just related of my father's, I think, sets beyond a doubt. I would therefore regard the cœcum, I repeat, rather as the great receptacle for water than a secondary stomach; though what portion of aliment is retained may and does undergo further conversion, still it would have suffered the same change had it at once been received by the

improved in condition and appearance altogether that I could hardly recognise him as the same ill-conditioned, debilitated, hopeless animal I had been treating so little time ago. Mr Banks told me, that he was still 'addicted to tippling,' but not to any considerable amount."

colon: I have never yet been able to discover traces of those peculiar, gastric, digestive functions that have been ascribed to the cœcum. As will be seen from what is past, I am also at variance in opinion with those veterinarians who assert, that the alimentary mass, or any part of it, *must of necessity* pass through the cœcum before it enters the colon.

In the human subject and in carnivorous animals, the contents of the large intestines are generally considered as excrementitious; but in the horse and many other vegetable feeders, we are not to suppose that the ends of digestion are fulfilled as soon as the residue of the chyme passes into the colon. It appears still to require elaboration, not only probably for the disengagement of fresh chyle, but for the separation of those chylous matters left unabsorbed in the small intestines. Hence the great vascularity of the colon, hence its numerous lacteals; and now we perceive the uses of the cells of the colon, and of its flexures, dilatations, and contractions; *viz.* to contain a large quantity of matter, to prolong its stay, or (what is tantamount to it) retard its passage, and to afford an extensive surface for the absorption of its watery and chylous remainder. That the colon, from its serpentine figure, cavernous interior, and local diminutions of calibre, (especially that at the commencement of the second flexure,) will retard the passage of its inspissated contents, needs no mechanical genius to discover; and that its cells, while they enlarge its capacity, must extend the absorbent surface, is no less perfectly obvious.

Before it leaves the colon, the residue of the chyme, having been deprived of its watery parts and become tainted by the excrementitious residue of the secre-

tions, is converted into an inspissated fæcal mass, and parcelled into small portions in its passage through the contractions of the colon, which owe their triangular shape to having been moulded within its cells. Having acquired a peculiar offensive fetor, which is principally attributable to a degree of putrefactive decomposition, and a color bearing more or less relation to that of the food, the dung-balls are pressed into the rectum, which gut, with the last turn of the colon, forms a reservoir for their temporary lodgment.

We do not find any formation in the rectum to detain the feculent matters—on the contrary, every thing favors their expulsion, the intestine itself is straight, or nearly so, and increases instead of diminishing in calibre, from its origin from the colon almost to its termination. Its use is to serve as a convenient receptacle for the fæces, until the animal, prompted by a certain feeling of uneasiness, or necessitated by an irresistible one of pain, makes efforts to expel them. Having placed his hind quarters in a certain convenient posture, the muscular coat of the rectum, aided by the general compression of the bowels by the diaphragm and abdominal muscles, overcomes the sphincter ani and dislodges and evacuates the contents.

In the course of this lecture I have refrained from any mention of the influence of the nervous system in digestion, because the manifestation of it, though indisputable, is but a fact of recent development, and because I would not run the risk of complicating my descriptions with the present speculative though highly important disquisitions on its nature and operation. What follows, however, appears to be matter of fact, and this inference fairly deducible from it—that both chymi-

fication and chylification are, in a measure, if not essentially, vital processes: *viz.* that simple section of the nerves going to the stomach retards digestion; that section of them, with loss of substance, much interrupts, though it does not abolish the process; and that narcotics, when they induce coma, occasion the like interruption.

In conclusion, I shall offer some observations

On Vomition.

THOUGH his power of rejecting the contents of the stomach, is no longer questionable, it may, and with truth, be maintained, that Nature has not endowed the horse with the *faculty of vomition:* whenever it happens, whether the act be a voluntary or an involuntary one, it must ever be regarded as one out of the course of nature.

An opinion has been current, that whatever a horse vomited must necessarily all pass through his nose; and certainly the anatomy of the fauces appears to warrant such a conclusion. This is a mistake however; for the depression of the larynx in the act of retching admits of the escape of some of the discharged matters, and occasionally of a considerable portion of them, into the mouth. In the case of gastric tympany I have related *, the animal had, shortly before death, three copious liquid ejections from the stomach, much of which was vomited by the mouth.

That we have not ready means of exciting *nausea* is still more hypothetical. A dose of aloes seldom fails to cause it, and we may at any time produce it, to any

* In a note "on the diseases of the stomach" Lecture xliv.

degree we wish, and often with the most beneficial results, by the administration of white hellebore: this may be carried so far as to excite painful efforts to vomit, but I have not seen the act itself occasioned by it. Henbane and wolfsbane, Professor PEALL assures us, have similar effects.

Having shown that the horse is susceptible of nausea, and that he can and occasionally does actually vomit, through the mouth as well as through the nose, however painful and unnatural the effort may be to him, I shall now agitate the *old* question—why he has not naturally the faculty of vomition. On this subject, M. GIRARD (père) has written a "Memoir*" which contains so much practical and conclusive information that I cannot resolve the question in a more explanatory and satisfactory manner than by translating that part of it which relates to the horse.

M. GIRARD commences his Memoir by observing that "Vomition in domesticated herbivorous quadrupeds, is a veritable phenomenon, an extraordinary effort, always accompanied with more or less pain; and so much the more important to become acquainted with, since it is either the signal of a sudden restoration of health, or else that of approaching and inevitable dissolution."

Afterexamining the stomachs of the dog and hog, and those of omnivorous animals in general, and comparing them in relation to their shape, structure, and position; M. GIRARD deduces this inference—"From this short exposition, it would appear that vomition is performed

* "Memoire sur Le Vomissement contre Nature dans les Herbivores Domestiques," appended to his "Anatomie Veterinaire" Par J. GIRARD.

with more or less facility according as the antiperistaltic motion, the efficient cause of the operation, is uniformly conducted from one extremity of the stomach to the other, and as it is thence readily propagated to the esophagus: this is no hypothetical inference, but one that appears to be very conclusive, if a comparison be made of the stomachs of carnivorous animals with those of herbivorous monogastrics, which last are justly regarded as not having the faculty of vomition."—The Professor now remarks, that the horse's stomach is much curved, and deeply lodged under the crura of the diaphragm, at a considerable distance from the abdominal muscles; that it is so loosily attached that it varies its position with its volume, and that this positional variation is favored by the curvation made by the esophagus within the belly, one about three inches long, which is received into a fissure of the liver; and further, that when it grows large and stretches backward, this esophageal prolongation is something lengthened and more or less straightened, whereas the contrary happens whenever the stomach re-approximates the diaphragm. "The most important characteristics," continues GIRARD, "of the stomach of the horse, compared with those of the dog and hog, regard its structure. The esophagus is inserted about the middle of its small curvature, and consequently very near the pylorus. In piercing the coats of the stomach, it takes an oblique direction, as the ureters do in entering the bladder. Within the stomach, it forms a little furrow which runs very obliquely, and imperceptibly vanishes: this anatomical mechanism at once explains why convulsive actions in the stomach rather tend to contract than dilate the cardiac orifice. From a little posterior to the place

where the crura cross the aorta to the stomach, the muscular membrane of the esophagus becomes imperceptibly pale, stronger, thicker, and remarkably firm: this part maintains a permanent state of constriction, which is only overcome by substances passing into the stomach." This membrane is continued upon the stomach itself where its fibres are so disposed that the cardiac portion possesses the greatest powers of resistance and contractibility.—Internally, the lining of the stomach may also impede indirectly the retrogade passage of the aliment by the folds it is thrown into, which, GIRARD is of opinion, have a valvular operation.

"These divers considerations show, that the circumstances that unfit the horse, the mule, and the ass, to vomit, essentially depend- first, upon the mode of insertion of the esophagus into the stomach, secondly, upon the particular disposition of the muscular membranes of these organs. All other causes are but accessory, or but indirect in their operation."

The remaining part of this Memoir is devoted to the detail of some interesting experiments and cases, illustrative of what has been said, the transcription of which would spin out this lecture to too great a length.

LECTURE LII.

On Purgation and Purgative Medicines.

BY *catharsis* or *purgation* is meant, the operation of certain medicinal substances which stimulate the intestinal canal to evacuate its fæcal contents in a liquid state, and in greater quantities or at shorter intervals than under ordinary circumstances. These substances are denominated *cathartics* or *purgatives*. The number of them in use in veterinary practice is very inconsiderable when compared to the catalogue displayed in the therapeutics of the surgeon; but before I proceed to particularize them, I shall take a summary view of the theory of purgation.

In the administration of cathartic medicine we have two objects in view. The one is, and one, says Dr. HAMILTON *, from which I can hardly suppose that debility will ensue, to bring off the contents of the bowels, which are out of the course of circulation, and, in so far, are already in a manner extraneous to the body, the other, to excite a determination of blood to the internal surface of the intestinal canal, in order that some of it may be evacuated in the form of secretion. This latter is what is meant by a full purgative

* "Observations on the Utility and Administration of Purgative Medicines." By JAMES HAMILTON, M.D.

effect, the former, what is understood by a gentle purgative operation; some practitioners however limit the meaning of the word *purgative* to the first, and denominate the latter a *laxative*.

The *modus operandi* of a cathartic may be thus briefly explained. Supposing it to be aloes, as soon as it has undergone solution, partial or entire, in the stomach, it irritates and reddens the vascular lining, and augments, if not alters, the gastric secretions: from which disordered condition of the organ arise nausea and loathing of food. Secondly, it stimulates the lining of the intestinal canal, and this is followed by acceleration of the peristaltic action, whereby the contents are hurried onward to the anus, and by an augmentation, if not alteration, of the intestinal juices, which is the principal source of the liquidity and profuseness of the evacuations. Thirdly, cathartics in general appear to increase the influx of the biliary and pancreatic secretions: an effect that further contributes to the quantity and fluidity of the discharged matters.

I shall next cursorily point out the healthy states, and some of the diseased or disordered conditions of body, in which we are in the habit of administering cathartic medicines. For purgatives are sometimes given in health as preparatives or auxiliaries to putting horses in condition; whereas they are never given in disease but to remove that which is the cause of the malady, or that which has more or less influence in its progress or continuance. The simplest view we can take of the exhibition of a dose of cathartic medicine, is the expulsion of the fæcal contents of the large intestines in a shorter time than they otherwise would have been discharged: this is what is called "unloading the bowels," and is the principal intention

in purging horses that have been recently taken up from grass. But, it is scarcely possible thus to limit its operation; for even every *laxative* that we administer, must in some degree augment the intestinal secretions, if not the biliary and pancreatic as well, and thus remotely be productive of other consequences. When we improve the condition of a horse in apparent health by the administration of alteratives, or laxatives, or cathartics, we are said to accomplish it by urging the various organs employed in the digestive process to a more vigorous performance of their functions; but if all the amelioration the animal's constitution has evidently experienced be duly estimated, this confined reasoning appears to be inadequate and unsatisfactory: there would seem to be disorder or derangement present somewhere in the system in all these cases, the removal or rectification of which, either temporary or permanent, was the remote effect of the medicine, and that on which its salutary efficacy depended. How much do a few well-timed doses of laxative medicine contribute to restore the condition of a poor horse—how influential soiling is in inducing a thriving diathesis, and promoting fatness and sleekness, and every other appearance indicative of robust health—and yet these ameliorated states probably were not preceded by any signs whatever of disorder or disease! And it is in the alterative and laxative forms that cathartics are so beneficial in promoting health that appears to be flagging: in fact, they are effectually under such circumstances veritable tonics.

There are certain *manifestly disordered* states of body also in which laxatives are preferable to purgatives in full doses. In all cases of habitual pursiness or thick-

ness of breath, (from previous organic disease,) in broken wind and in permanent roaring, in evident imperfection of the digestive process, and in some cutaneous affections, their judicious exhibition will often be found to be eminently serviceable.

Of the direct effects of a full dose of cathartic medicine on the system, we have pretty satisfactory evidence. Not only does it influence the general distribution of blood by causing a preter-natural determination to the abdominal viscera, but its operation is attended with a greater consumption of that fluid, in consequence of there being an augmentation of the intestinal and probably other secretions. And when we calculate the extent of the secreting surface of the alimentary canal, and take into our consideration that there may be an augmented afflux of other secretions to it, in addition to its own, we shall be able to form some idea of the loss of vital fluid the system may sustain in this way. nothing, indeed, can evince to us the debilitating effects of cathartics more strikingly than the quick depression of condition, and with it strength and spirits, which supervenes upon excessive purgation. Even as a depletive therefore, next to blood-letting, catharsis is the most potent remedy we possess; and it is chiefly with the intention of determining blood to the bowels and of drawing it off in the form of secretion, that we employ purgation in most inflammatory diseases.

I shall now enter upon the consideration of those substances that are employed as cathartics in veterinary practice, and shew their doses and medicinal properties as far as my own experience, united with that of others, has ascertained them. And here it would give me great

satisfaction to display a list equal in variety and utility to that available in human medicine; but I am compelled to set out in my investigation with the disclosure of this extraordinary fact—that of all the substances that have been introduced from time to time into medicine, or discovered to be poisons, only two are generally admitted to be safe and efficient as cathartics when administered to horses: and one of them, in this country, is quite a recent production. It is true that in most old, and in some modern veterinary works, there are other substances prescribed as cathartics; indeed, in some of the former, there are as many and as various formulæ for purges as might be desired; but, unless their principal and efficient ingredient is aloes, either they possess no such power at all, or they are uncertain and even dangerous in their operation.

Aloes, till lately the only serviceable cathartic, still probably the best in our pharmacopeia, appears to have been long known to farriers, grooms, and others, who have been in the habit of giving from an ounce to two ounces at a dose, so that twenty or thirty years ago, before veterinary science had become diffused, a prevailing cause of fatality was super-purgation: and indeed, at the present day, to over-doses and injudicious regimen many horses fall victims that are said to have *caught cold* or to have received injury from *spurious medicine*. Aloes is a drastic purge, and one that for general purposes, I repeat, appears to be equalled by no substance with which we are acquainted; the space of time however it requires to produce its cathartic effect, and the acrid and irritating qualities inseparable from it, render it objectionable and inadmissible in some special cases in

practice. It has been said, that we *cannot* purge a horse in less than twenty-four hours, but that we can open a man's bowels in two, or even one. As this remark however is grounded upon the effects of aloes on the horse and neutral salts on the man, the comparison is by no means fairly drawn, and to prove that it is not, there are medicines that will purge a horse in half that time, and we know that if a man take a bolus of aloes over-night it will rarely operate before the following morning. It is rationally deducible from its length and peculiar conformation that the alimentary canal of a horse will not permit that quick passage through it that ours will; and from the attempts that I have made, by experiment, to produce a less tardy purgation, though the practicability of it can be demonstrated, I am very much inclined to come to these conclusions:—that the production of catharsis in a less space of time than twenty hours, will not be unattended with risk; and that this risk will increase into danger as the means we may use may shorten this or some such interval.

In veterinary medicine an inferior kind of aloes is made use of:—either the hepatic or Barbadoes, or the caballine or Cape aloes. Some practitioners are in the habit of exhibiting the former, some the latter—each party maintaining their comparative efficacy and superiority by an immediate reference to long and incontrovertible experience. Though I am no reverer of experience myself when it rests upon practical affirmation alone, if I were called on to arbitrate this point, I should say, from all that I have been able to collect, that these apparently contradictory opinions were both well grounded, and that if practitioners would take the

trouble attentively and impartially to examine the aloes, and the subjects to whom, and the circumstances under which, they prescribed this or that aloes, there would soon cease to be any difference of opinion upon so plain and palpable a point of practice. Private practitioners in general, I believe, are in the habit of making up Barbadoes aloes; the Veterinary College, and the whole of the Cavalry and Ordnance Veterinary Establishments are (and always have been) supplied with Cape aloes.

The dose, under ordinary circumstances, is *six* drams of Barbadoes aloes or *seven* of Cape aloes; for, whether the latter be obtained from the dregs or sediment of the former, or whether it be a distinct variety, there certainly does appear to be this difference in their cathartic virtues: a circumstance of itself, I have no doubt, that, for want of advertence to, has contributed to keep alive the discordant reports of their comparative efficacy. It is a common and a commendable practice to introduce into the cathartic ball some essential oil or aromatic ingredient; for this has the two-fold effect of imparting an agreeable odor to it, and of counteracting its harsh or griping effects upon the bowel *. Though six or seven drams, however, is what I consider a medium or standard dose, it is evi-

* These formulæ may be indiscriminately exhibited.

℞ Aloes Caballinæ 3vij.
Ol. Essent. Menth. Pip. vel Carui gtt. xx.
Saponis Duri 3j.
Theriacæ q. s. ut f. Bol.
vel,
Aloes Barbadensis 3vj.
Saponis Duri 3j.
Syrupi Zingiberis q. s. ut f. Bol.

dent that this must be constantly varied according to the size, make, age, condition, and apparent strength or constitution of the animal. Should the horse be strong and bulky, we may, as a general rule, in the ratio in which he is so, augment the dose to one dram, two drams, or even three; on the other hand, should the subject be slender or diminutive, we shall have occasion to reduce the dose. Horses with large bellies and circular chests in general require a dram or a dram and a half more of aloes than those (equal in height) of an opposite conformation; and if they have past their fifth year, and are "full of hard meat," they will endure the operation of *strong* cathartics, but if they are heron-gutted, narrow-chested, out of condition, or have been recently taken up from grass, the very same doses may be followed by super-purgation and death. Peculiarity of constitution also is not to be entirely overlooked. Professor COLEMAN, in his lectures, used to make mention of a horse of his own that would purge from the administration of *three* drams of *Cape* aloes; Mr. O'CONNOR V. S. Newmarket, informed me, that a thorough-bred filly of his, only three years old, although she underwent three or four days' preparation, required *fourteen* drams of *Barbadoes* aloes to produce the ordinary cathartic effect under every advantage of exercise and dilution, and that a particular insusceptibility or torpor of bowel had been remarked in the progenitors of this filly. I may add however, that racers in general, in consequence of the high feeding and strong exercise they are inured to, require large doses of purgative medicine.

When we purpose to administer a full dose of cathartic medicine to a horse whose state of health does not

require its immediate exhibition, we commonly diet him—what is termed *prepare* him beforehand. We feed him during the preceding day, sometimes for two or three days before, on bran or bran mashes in lieu of corn; for bran, like green meat, is easily digested, is not long retained in the bowels, and requires less stimulus to expel it than either corn or hay; so that a somewhat less dose of aloes is sufficient when this preparative regimen has been observed. Supposing then that the horse has been mashed over-night, the purge should be given early in the morning, either at least two hours after he has been, or the same time before he shall be, watered, and not less than an hour before he shall be fed: in the course of the same day he may be moderately exercised. The principal part of his food should now be scalded bran—bran mash, either warm or cold; though some hay, but no corn, may be allowed him: during the summer I have not been in the habit of forbidding green meat. Water, before it is given to him, particularly in winter, ought to be made of the temperature of the stable. Warm clothing, under such circumstances, in cold situations, is always highly desirable.

The space of time in which aloes produces purgation, *cæteris paribus*, will depend upon the state of the bowels at the time of its administration, and upon the regimen that may be adopted during the interval—prior to its operation. Bowels, the contents of which admit of being made soluble by mashing, and have already been rendered so by bran or by green food, will often be affected in twelve hours; whereas those that have been habituated to an astringent provender—to old hay and oats and especially to beans, will often require

thirty and even forty hours to be moved. The operation itself will be principally influenced by the regimen we may pursue at the time, and mostly by exercise and by watering. If the medicine should not take effect on the following morning—twenty-four hours from its administration, which is generally the case, first give the animal as much water as he will drink, and then walk him out briskly for about an hour or an hour and a half, unless he purges; for as soon as his evacuations have become liquid and frequent, he ought to be returned into the stable, littered down, and plentifully supplied with water: warm or cold mashes may be offered to him, but at this time he will seldom show a disposition to feed. Should he however at the expiration of his exercise not purge, he will probably eat a mash on being led into the stable, and be inclined to drink again: at all events, I would give him at this time no hay. During the succeeding four hours he should continue quiet in the stable, and be offered water hourly, and then, if he continue unmoved in his body, taken out and exercised a second time; and now, after having walked for half an hour without the desired effect, he may be first gently and then pretty briskly trotted: I wish it to be understood however, that he ought not under any circumstances be made to gallop. The old maxim was, to exert the animal "until he purged or sweated;" but were we implicitly to follow this quaint rule, I am inclined to think with Professor Peall, that it would in some instances prove "the last trot or gallop the animal could be made to perform;" for all violent means to increase the peristaltic motion must evidently have a tendency to excite inflammation of the bowels. When we first perceive

any signs of purgation, or of laxity—the prelude to it, we may often, by the subsequent regulation of exercise and watering, control to a considerable degree the operation of the medicine; we may (when we have apportioned the dose nicely) allow it to pass off with a laxative effect, or we may suffer it to produce its full operation; and we may save an over-susceptible or over-dosed animal from super-purgation and its pernicious consequences *: all this therefore shows the great advantages derivable from paying attention to exercise and dilution. In the course of the third day, generally speaking, the dung passes in soft but consistent masses, and then it is said that "the physic has set;" on the fourth day the fæces commonly re-appear of their globular shape, from which period the animal may be gradually inured to his ordinary work.

The time then taken up in subjecting a horse to a full dose of purgative medicine, is three days:—on the first it is administered, on the second day it operates, and on the third it sets; for the three or four following days however the horse cannot be said to have completely recovered from the disturbance it has created in the system; and hence the practice, when two or three doses are about to be given, unless under circumstances of disease, of making the interval between them not less than a week, is a very necessary one, both as regard the safety of the succeeding dose and the benefit derivable from that last administered. Not, however, that I subscribe to that vulgar and absurd, and till lately to me unaccountable practice, of unexceptionably giving *three* doses, by way of preparation,

* Vide Lecture on Diarrhœa.

to horses that are to be put into condition; I say *till lately inexplicable*, for a friend of Professor PRATT's, a veterinary surgeon, to whom I beg leave to express my obligations on this occasion for saving me much fruitless research and probably some unfortunate inferences, received the following syllogistical statement on this abstruse point from a groom, an enthusiastic admirer, as well as a strict follower, no doubt, of the humoral pathology —"The first dose merely *stirs up* the humors, the second *sets them afloat*, and the third *carries them all off!!!*"

As CASTOR OIL is said on good authority to be an useful cathartic, while others aver that it is not more efficacious as such than so much common or olive oil, I shall give the result of my experience of these substances. To a horse that was constitutionally healthy and had been mashed the preceding day, lbiss. of castor oil was given at ten o'clock, *a. m.* He purged *ten* hours after, and continued to purge all the next day. To a farcied horse lbj. was given at half-past nine o'clock, *a. m.* who had been mashed over night. He was exercised thrice during the same day without any signs of purgation ensuing. At three *p. m.* he became dull and languid, refused his food, and had an accelerated pulse. These symptoms hourly increased —at nine *p. m.* his pulse was 70°, his abdomen was contracted, he stood with his hind legs advanced under his body and his back roached—"all of a heap"—in fact, he appeared to be suffering much abdominal pain, though it was not acute enough to produce symptoms of gripes. These symptoms continued with little variation until seven *p. m.* the next day, at which time he passed the *first* liquid evacuation. On the third

day, his dung, which he voided but seldom, was soft, these evacuations however always appeared to relieve him. His health was not restored for several days afterwards. In order to form some comparison between the medicinal qualities of castor and common oil, a glandered horse, whose general health was good, was subjected to this experiment. His food being hay only, first he took lbj. of the *sulphate of magnesia* dissolved in lbiss. of water, without effect. On the fourth day after this, lbiss. of castor oil was given to him. Thirty-two hours after his dung, which had previously appeared in balls, fell in small, irregular pieces, as if preparatory to purgation; no signs of that state of bowel, however, or of uneasiness followed. On the fourth subsequent day, lbiss. of olive oil (second quality) was administered. Next day the dung-balls became soft and were united in masses, but no symptoms of purgation ensued. In order to ascertain to what degree this horse's bowels were susceptible of the operation of cathartics, on the third day from this, ʒv. of Cape aloes were given to him. In the course of the following day he experienced brisk and profuse purgation. The similarity of circumstances under which these several substances were exhibited was scrupulously preserved. From these and other experiments I have come to these conclusions:—1. That castor oil, as a cathartic, in doses of lbj. and lbiss, is either inefficacious or very uncertain—not to add unsafe or even dangerous in its operation. 2. That olive oil, in the same doses, is equally unserviceable as a cathartic. 3. That sulphate of magnesia, in the dose of lbj. possesses no cathartic property whatever. My father, who had previously exhibited these medicines in large doses separately with similar results,

gave to a horse (destined to slaughter) *Ol. Ricini* lbij. *et Magnes. Sulphat.* lbj. *solut. in Aquâ.* On the following morning (twenty-four hours after) no effect having been produced, the same dose was repeated. Towards night his bowels became gently moved; but in the course of the night excessive purgation came on, which was accompanied with nausea, loathing of food, and symptoms of irritated bowels, and which the next day ended in death.

Linseed oil however, I have been respectably informed, is a certain and a powerful cathartic. I have seen it given to five horses, at different times. Two of them took it in doses of lbss. In one it produced purgation in twenty hours; in the other, it only relaxed the bowels: they were not exercised. In two others who were drenched, each of them, with lbj. of the oil, it took no perceptible effect whatever. A horse, about to be destroyed for acute glanders, took lbiss. of it. Thirty hours after he purged without exercise or mashes; and his evacuations strongly impregnated the atmosphere of the stable with the peculiar disagreeable odor of the oil: the purgation continued throughout the third day, and then set without any unfavorable symptoms. I am by no means satisfied however about the invariableness and safety of its operation as a cathartic: on the contrary, until I have had an opportunity of investigating its medicinal properties further, I shall not prescribe it myself but by way of experiment.

Gamboge is certainly possessed of drastic cathartic properties, but as a medicine nearly the same objections appear to be applicable to it. 3j. of it purged one horse in twenty-four hours as violently as if he had taken an

ounce of aloes. Another was taken off his feed by ʒiss. but not even relaxed in his body. To three other horses were given doses of ʒij. In thirty hours after, one appeared nauseated and relaxed a little; but no subsequent purgation took place. Balls, each of which were compounded of ʒiij. of gamboge and gtt.xij. of the essential oil of carraway, were given to three other horses. Though not one of them was purged, the medicine so much disordered them that they refused their food during the following day, were tucked up, dejected, and apparently in much uneasiness or pain from it. To a horse glandered and farcied, ʒiij. were given one morning and repeated on the following one. On the third morning the animal was seized with great prostration of strength, had great difficulty in rising when he had lain down, and his pulse was very frequent and scarcely perceptible; *but he did not purge.* Several days elapsed before the animal recovered his wonted appetite, strength, and spirits. At the expiration of which (a week) he was destroyed. The vascular lining of the stomach shewed marks of intense inflammation, as also did that of the intestines, though in a less degree.—I look therefore upon gamboge, as I do upon many other medicines which, it cannot be denied, possess considerable cathartic power, as an uncertain, an unsafe, and in certain doses a virulent medicine; and as one not only of doubtful efficacy, and therefore unserviceable in common practice, but as a purge that ought to be banished altogether from our pharmacopeia. I have often thought though that it might prove an useful adjunct to aloes, but I have never made trial of the combination.

Lastly, it is probably expected that I say something

about a newly-introduced cathartic medicine which for potency of operation far surpasses any one that has hitherto been made trial of. I allude to the *Croton Tiglium*. I need not enter into its natural history, nor stop to inquire who first exhibited it in this country. Mr Hodgson informs me, that it is known and used in India, its native soil, as a purgative to horses, and Mr. John Field, Junior, V.S. London, has, with a promptitude and professional liberality which demand my particular acknowledgments, favored me with such communications as have enabled me to write with a degree of confidence and decision upon its medicinal properties, for which information those who are unacquainted with its virtues must also hold themselves professionally indebted to the experimental researches and extensive opportunities of that gentleman. It appears that in India, where the tree is cultivated on account of its purgative qualities, both the wood and seeds are medicinally used; but I believe that the seeds are the only part of the plant that has as yet been administered in this country. Mr. Hodgson tells me, that the natives are in the habit of roasting the seeds, which process is found to render them less acrid and violent in their operation, and that a celebrated physician in India prescribes a seed so prepared to be made up with six grains of calomel into four pills, two of which he generally directs to be given at bed-time, and the remaining two after an interval of twelve hours, unless the bowels be affected. And Mr. Hodgson gave, at Calcutta, gr. xxv. of the roasted seeds—*joomalgota*, as the Indians have named the plant, to a young healthy horse, that was exercised and fed as one under the operation of aloes. At the expiration of thirty hours

the animal passed an evacuation like cow's dung; during the twenty-nine succeeding hours, without any further exercise, he had twenty-three discharges of the same consistence. Another horse that took gr.xxx. began to purge after twenty-five hours, and continued to pass liquid evacuations for two-and-a-half days: solid dung also came away at intervals.

There is another tribe of plants—the *jatropha*, the seeds of one species of which, the *jatropha curcas*, in Hindoostanee *bagbarunda*, seem to be allied in their cathartic qualities to those of the croton. Mr Hodgson says, that in India two or three of these seeds (not roasted) constitute a dose for a man, and that he has given them to horses, but that his experiments turned out too inconclusive to hazard any deductions.

The croton seed, as is well known, in the dried state in which it is imported, is about the size of a tick bean, is oval-shaped, and of a dark brown color. If it be split open, it will be found to consist of a strong capsule, inclosing a yellow, soft, and an oily kernel, between which is a light-colored pellicle that adheres to both, but more closely to the latter, apparently through the intervention of a furfuraceous volatile powder which is very apt to fly into the eyes and fauces in splitting the capsule, where it does not fail to occasion considerable irritation. The kernel itself is composed of an oil mostly separable by expression, making up about one-fifth of its weight, and of a farinaceous residue, constituting the remaining four-fifths, which, from being caked by expression, requires to be triturated, and is then presented to us in the form of a light brown oleaginous farina.

Though every part of the seed possesses the purgative

quality, the capsule appears to be the least active when given internally. Mr. FIELD exhibited ʒij. of it to a cart horse with no more effect than had been previously produced upon the animal by gr.xl. of the farina.

The oil, which has lately been admitted into the London pharmacopeia, is now considered to be one of the most powerful drastic purges used in medicine; it has however maintained so high a price that, were it recommendable, it could not be introduced, as a general cathartic, into veterinary practice. I should say that the average dose of the oil was gtt.xl. and that this might be with caution and discrimination increased to a dram. One horse to whom a dram was given, was most violently purged in twenty-four hours after. Mr. SEWELL gave ʒss. of the oil to an ass about a twelvemonth old, and the following morning, no effect having been produced, ʒiss. more: this was followed by profuse diarrhœa and symptoms of excessive irritation of bowel, which ended in death. The mucous coat was found intensely reddened throughout the intestinal canal. In a word, from what I have observed myself and been able to collect from others, I should say that the oil was most unquestionably a cathartic of great power, but that its efficacy was not of that certain and definite character which would warrant its arbitrary exhibition in practice: indeed, I cannot divest my mind of the idea of a species of virulence about it which seems to unfit it for common use.

Unless it be exceeded in this virtue by the furfuraceous powder sticking about the pellicle, the FARINA has been found by Mr. FIELD to possess the cathartic quality in the most eminent degree: and this is the part which that gentleman is now in the habit of exhibiting with a

degree of certainty and safety not inferior to aloes itself. It may be given in powder, or in tincture, or in aqueous suspension. In powder, Mr. FIELD considers gr.xxx. of it to be equivalent in efficacy to 3vj. of *Barbadoes* aloes; and this we may, in a general way, regard as the rule whereby we are to dispense it—reckoning gr.v. as equal to 3j. of the aloes.

The TINCTURE Mr. FIELD makes, by macerating, for two or three days, ℈j. of the farina in ℥j. of rectified spirit, and then filtering the solution. By this process the farina is deprived of its cathartic virtue, and we have a clean, and an elegant preparation, either for internal or for external * use. But if the tincture is mixed with water, the mixture becomes cloudy, and a white filmy precipitate slowly forms and subsides, which Mr. FIELD believes (for he has not yet ascertained the fact) to be the same substance—the purgative essence extracted by the spirit from the farina: if this be the case, it would be desirable to obtain this sediment in a separate state, for it might turn out to be a highly concentrated cathartic preparation. When the tincture however is first thrown into a large body—a pailful of

* Oil of turpentine will also deprive it of its essential property, and thereby acquire a highly stimulant power. By macerating ℈j. of the farina in ℥j. of oil of turpentine, Mr. FIELD found that he had obtained a very acrid irritant to the skin; for, by rubbing the hip of one of his cart horses with this solution, and the opposite hip with the same quantity of plain oil of turpentine, he found that the solution, in the course of four-and-twenty hours, had excited not only exquisite tenderness but considerable tumefaction, which ended in desquamation of the cuticle and separation of the hair, whereas the turpentine itself only occasioned a little tenderness and irritability which in a short time altogether subsided.

water, the precipitate is so small and becomes so much diffused that it will remain for many hours in a state of suspension, and thus a sufficiency of it to purge may be voluntarily drunk by the animal if he have been kept for some time previously deprived of water.

I think that enough has already been said to convince every unprejudiced mind of the fitness of croton for a place in our pharmacopeia: were it only for the smallness of the dose, and the variety of forms and compounds in which it may be exhibited, it could not fail to prove occasionally serviceable, when aloes was madministrable, both to the public and private practitioner, and more particularly to the latter, who has now an opportunity of sheathing a common purge from the impertinent inquisitiveness of his *knowing* employers. In a scientific point of view however, we ought to experience other advantages from it before we subscribed to its real utility in practice; for if it differs not in its effect or operation from aloes—if indeed it does not possess some advantage as a cathartic over that medicine, then, as such, it is not worth our consideration: to say, that to deserve notice it ought to *surpass* aloes, is too absurd to merit a reply. The first question then is, does croton differ either in its operation or effects from aloes?—the second, if it does differ, does it advantageously and availably so in practice?—and upon the answers to these questions I think every unbiassed inquirer will form his opinions. Croton takes cathartic effect in about the same space of time that aloes does—certainly not sooner. But, Mr. Field has observed that it does not create those signs of nausea and sickness which are so generally induced by an aloetic purge; and that, when it does operate, the evacua-

tions are more profuse and watery, in consequence of its emulging more intestinal secretion, which is followed, as might be naturally expected, by greater and more permanent debility of system. It therefore may be given, I should presume, with advantage over aloes in disease when it is an object to thoroughly scour the bowels and sensibly deplete by catharsis; and in health, to large, gross horses, overloaded with flesh, that we wish to put speedily into condition. On the other hand, Mr. Field has not found that the exhibition of croton is followed by those beneficial effects upon the digestive organs which are so conspicuous after well timed and regulated doses of aloes: here, then, it falls short, not of our expectations, but of the expectations of those who assay every new cathartic they meet with by the standard of a medicine of which, if it were their misfortune, by any accident, to be deprived in the exercise of their profession, they might lament and say with our matchless bard—

> "You take my house, when you do take the prop
> That doth sustain my house; you take my life,
> When you do take the means whereby I live."

END OF PART II.

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